

NORTHWEST PIPE AND CASING
CLACKAMAS, OREGON
SITE ASSESSMENT REPORT

4.2.3



28103



ecology and environment, inc.

1500 FIRST INTERSTATE BUILDING, 999 THIRD AVENUE, SEATTLE, WASHINGTON 98104, TEL. (206) 624-9537
International Specialists in the Environment

July 2, 1993

Chris D. Field
United States Environmental Protection Agency
1200 Sixth Avenue, HW-113
Seattle, WA 98101

REF: TDD T10-9210-031

Dear Chris:

Enclosed please find a copy of the final site assessment report and a Potential Hazardous Waste Site Identification form for the Northwest Pipe and Casing Site, located in Clackamas, Oregon. Field work was begun in early October with TAT visiting the site to perform an elevation survey and to establish current site conditions. Drilling and sampling activities were begun on October 26 and concluded on November 20, 1992. A total of seven monitoring wells were installed using newly developed field screening technology to assist in selection of monitoring zones.

Based on analytical data collected from the monitoring wells and from on-site locations, potential degradation of regional groundwater quality is of concern. Data indicate high concentrations and unknown quantities of uncontrolled hazardous materials are present on the site. Similar compounds at lower concentrations were detected in groundwater along the sites former perimeter. TCE was detected in field screening analysis of groundwater samples collected while drilling. Inorganics, such as chromium and lead, and semivolatile compounds, such as phthalates, were detected in groundwater samples from monitoring wells. Continued monitoring of groundwater quality is recommended to establish a database and determine trends.

Direct contact is also of concern due to lack of site security and evidence of transient occupancy. Repair or replacement of fencing is necessary to prevent exposure to on-site contaminants.

NWPC warrants further consideration for removal activity to mitigate potential for environmental impact to groundwater and surface water. As a result of the variable on-site lithology, a general assesment of the feasibility of controlling groundwater while excavating cannot be made.

Mr. Chris Field
July 2, 1993
Page 2

Based on geologic data, it appears that, at some locations, excavation will not pose any problem while at others, dewatering and on-site treatment will be necessary. Exploratory excavations at known and suspected disposal locations are required to establish the depth at which the wastes are buried and groundwater quality and quantity.

Sincerely,

A handwritten signature in black ink, appearing to read 'Wm L Carberry', with a long horizontal flourish extending to the right.

William L. Carberry
Technical Assistance Team Leader

JJR/gam

Enclosure

Ecology and Environment, Inc. - Technical Assistance Team
Document Circulation Request

TO: William Carberry, TATL, E & E, Seattle
FROM: _____, OSC
SUBJ: Northwest Pipe and Casing Site Assessment Report
Clackamas, Oregon
REF: TDD: T10-9210-031

Please mail copies of the above-noted report to the following parties:

<u>Name</u>	<u>Address</u>	<u>Date Sent (TAT)</u>
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OSC

17 REMOVAL ACTION

XX SITE ASSESSMENT



POTENTIAL HAZARDOUS WASTE SITE
SITE IDENTIFICATION

I. IDENTIFICATION

01 STATE 02 SITE NUMBER
WA ORO201

II. SITE NAME AND LOCATION

01 SITE NAME (Legal, common, or descriptive name of site)
Northwest Pipe and Casing

02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER
9460 S.E. Lawnfield Road

03 CITY
Clackamas

04 STATE 05 ZIP CODE 06 COUNTY
OR 97015 Clackamas

07 COUNTY CODE 08 CONG DIST

09 DIRECTIONS TO SITE (Starting from nearest public road)

III. RESPONSIBLE PARTIES

01 OWNER (If known)
Wayne Hall Property Owner

02 STREET (Business, residence, mailing)

03 CITY

04 STATE 05 ZIP CODE 06 TELEPHONE NUMBER
(503) 654-6844

07 OPERATOR (If known and different from owner)
None

08 STREET (Business, residence, mailing)

09 CITY

10 STATE 11 ZIP CODE 12 TELEPHONE NUMBER
()

13 TYPE OF OWNERSHIP (Check one)
☒ A. PRIVATE ☐ B. FEDERAL: _____ (Agency name)
☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL
☐ F. OTHER: _____ (Specify)
☐ G. UNKNOWN

IV. HOW IDENTIFIED

01 DATE IDENTIFIED
10 31 92
MONTH DAY YEAR

02 IDENTIFIED BY (Check all that apply)
☐ A. CITIZEN COMPLAINT ☐ B. INDUSTRY ☐ C. STATE/LOCAL GOVERNMENT ☐ D. AERIAL RECONNAISSANCE
☐ E. RCRA INSPECTION ☐ F. SURFACE IMPOUNDMENT ASSESSMENT ☒ G. OTHER EPA IDENTIFICATION
☐ H. OTHER _____ (Specify)

V. SITE CHARACTERIZATION

01 TYPE OF SITE (Check all that apply)
☐ A. STORAGE ☐ B. TREATMENT ☒ C. DISPOSAL ☐ D. UNAUTHORIZED DUMPING ☐ E. OTHER _____ (Specify)

02 SUMMARY OF KNOWN PROBLEMS (Provide narrative description)
On-site buried waste. Documented soil and groundwater contamination. Northwest Pipe and Casing is National Priorities Listed.

03 SUMMARY OF ALLEGED OR POTENTIAL PROBLEMS (Provide narrative description)

VI. INFORMATION AVAILABLE FROM

01 CONTACT
Mark Ader

02 OF (Agency/Organization)
Region 10 USEPA

03 TELEPHONE NUMBER
206) 553-1674

04 PREPARED BY
JJ Roland

05 AGENCY

06 ORGANIZATION
E & E

07 TELEPHONE NUMBER
(206) 624-9537

08 DATE
5 19 93
MONTH DAY YEAR

TECHNICAL ASSISTANCE TEAM
SITE ASSESSMENT
FINAL REPORT FOR:

NORTHWEST PIPE AND CASING
CLACKAMAS, OREGON

TDD T10-9210-031

REPORT PREPARED BY: ECOLOGY AND ENVIRONMENT, INC.
PROJECT MANAGER: DAWN HARTLEY
DATE: MAY 1993

SUBMITTED TO CHRIS D. FIELD, DEPUTY PROJECT OFFICER
and JOHN SAINSBURY, ON-SCENE COORDINATOR
SUPERFUND RESPONSE AND INVESTIGATIONS BRANCH
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION X
SEATTLE, WASHINGTON

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ABSTRACT

Technical Directive Document T10-9210-031 tasked Ecology and Environment, Inc. (E & E) Region 10 Technical Assistance Team (TAT) to conduct a site assessment at Northwest Pipe and Casing, a National Priorities List site located in Clackamas, Oregon.

The purpose of the site assessment was to evaluate off-site groundwater quality to determine the need for a removal action to address allegations of waste sources buried on-site. Solvents and pipe coatings high in PAHs are reportedly buried throughout the site and were observed at the site surface. A total of seven groundwater monitoring wells were installed and sampled as part of this site assessment. In addition, on-site trenches were excavated adjacent to previously identified geophysical anomalies to evaluate groundwater quality associated with alleged burials.

Analytical data indicate the presence of tetrachloroethelene at a low concentration in one of the wells constructed on former Northwest Pipe and Casing property and downgradient of alleged sources. Semi-volatile and inorganic contaminants were also detected in monitoring wells along the downgradient border of current and former site boundaries. Groundwater collected from on-site trenches showed elevated concentrations of inorganics, VOCs, and PAHs and buried debris was observed. These data support the possible need for removal of on-site sources to mitigate potential threat to local groundwater and surface water resources.

SITE ASSESSMENT REPORT FOR
Northwest Pipe and Casing
Clackamas, Oregon
T10-9210-031

Site Name/Address:

Northwest Pipe and Casing
Between Lawnfield and Mather Roads
Clackamas, Oregon

Investigation Participants:

Dawn A. Hartley, TAT, Project Manager
Jeffrey Fowlow, TAT, Geologist
John J. Roland, TAT, Geologist
Michael Szerlog, TAT, Chemist
Mark Woodke, TAT, Chemist
Ecology and Environment, Inc., Seattle, WA, (206) 624-9537

Dates of Site Assessment:

October 26 to November 20, 1993

1.0 INTRODUCTION

The U. S. Environmental Protection Agency (EPA) Region X Superfund Response and Investigations Branch (SRIB) tasked the Ecology and Environment, Inc., (E & E) Region 10 Technical Assistance Team (TAT) to conduct an assessment at the Northwest Pipe and Casing (NWPC) site, located in Clackamas, Oregon under contract No. 68-WO-0037.

NWPC is listed on the National Priorities List (NPL) for hazardous waste sites requiring assessment and remediation by the EPA. On-site groundwater contamination was documented in a Listing Site Inspection (LSI) conducted by the E & E Region 10 Field Investigation Team (FIT) in 1990. Polychlorinated biphenyls (PCBs), inorganics, polycyclic aromatic hydrocarbons (PAHs), tetrachloroethene and other volatile organic compounds (VOCs) were detected by FIT in on-site groundwater and soils.

The EPA tasked the TAT to conduct a site assessment to evaluate groundwater quality downgradient of the site. Evaluation of the migration potential, and subsequent impact to local groundwater resources, would determine the need for a removal action to address allegations of buried waste.

2.0 SITE CONDITIONS AND BACKGROUND

2.1 Site Description

2.1.1 Site Evaluation

NWPC is the site of a former pipe manufacturing and coating facility in an industrialized section of Clackamas, Clackamas County, Oregon (Figure 1). The NWPC site was operated by various parties from 1956 to 1986 (E & E 1990). The site has been inactive since 1986, and although several buildings have been removed, numerous dilapidated structures remain. The site is fenced but holes have been cut along the Mather Road boundary and evidence of trespassing, vagrancy, and vandalism is apparent throughout the site.

2.1.2 Site Location

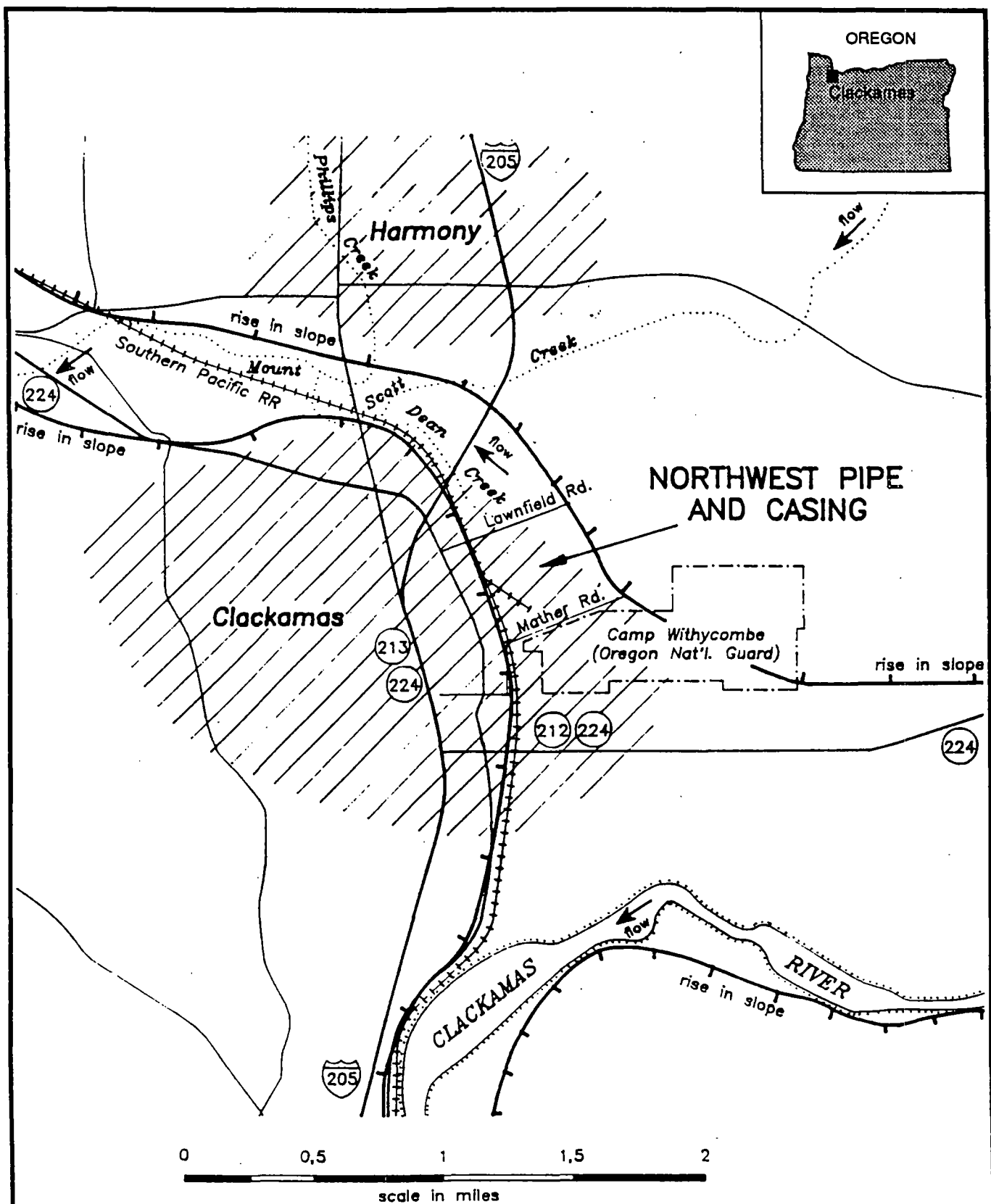
The NWPC site is located in Clackamas, approximately 20 miles southeast of Portland, Oregon. During operation, the facility occupied 55 acres in sections 4 and 9 of Township 2 South, Range 2 East of the United States Geological Survey (USGS) 7.5 Minute Series, Gladstone Quadrangle. Subsequently, the property has been divided into three separate lots. The primary NWPC site is the most significantly impacted and also the largest lot occupying 36 acres and designated Parcel B. The other two lots (each approximately 10 acres), designated Parcel A are currently occupied by the Oregon Department of Transportation (ODOT) and Northwest Development Company (NWDC) respectively (Figure 2). NWPC is located between Lawnfield and Mather Roads, and bordered to the west by the Southern Pacific Railroad. To the east lies Camp Withycombe, an Oregon National Guard facility and Mount Talbert.

2.1.3 Site Characteristics

The E & E Region 10 FIT conducted a Screening Site Inspection (SSI) at NWPC in April 1988 and subsequently a LSI that was completed in June 1990 (E & E 1990). The site was assigned to the NPL on October 14, 1992.

The investigations conducted under the FIT contract identified and documented surface soil contamination, subsurface soil contamination, and groundwater contamination within the primary NWPC site. Additionally, FIT documented geophysical anomalies indicative of buried metallic and non-metallic sources throughout the site. Suspicions that the anomalies were buried drums and sludge lagoons was never confirmed by the FIT.

The NWPC site is level, except for several manmade mounds, and is prone to flooding. The northwest half of the site is particularly susceptible and is commonly covered by standing water during winter months. A series of manmade ditches drain the site north to Mount Scott Creek.



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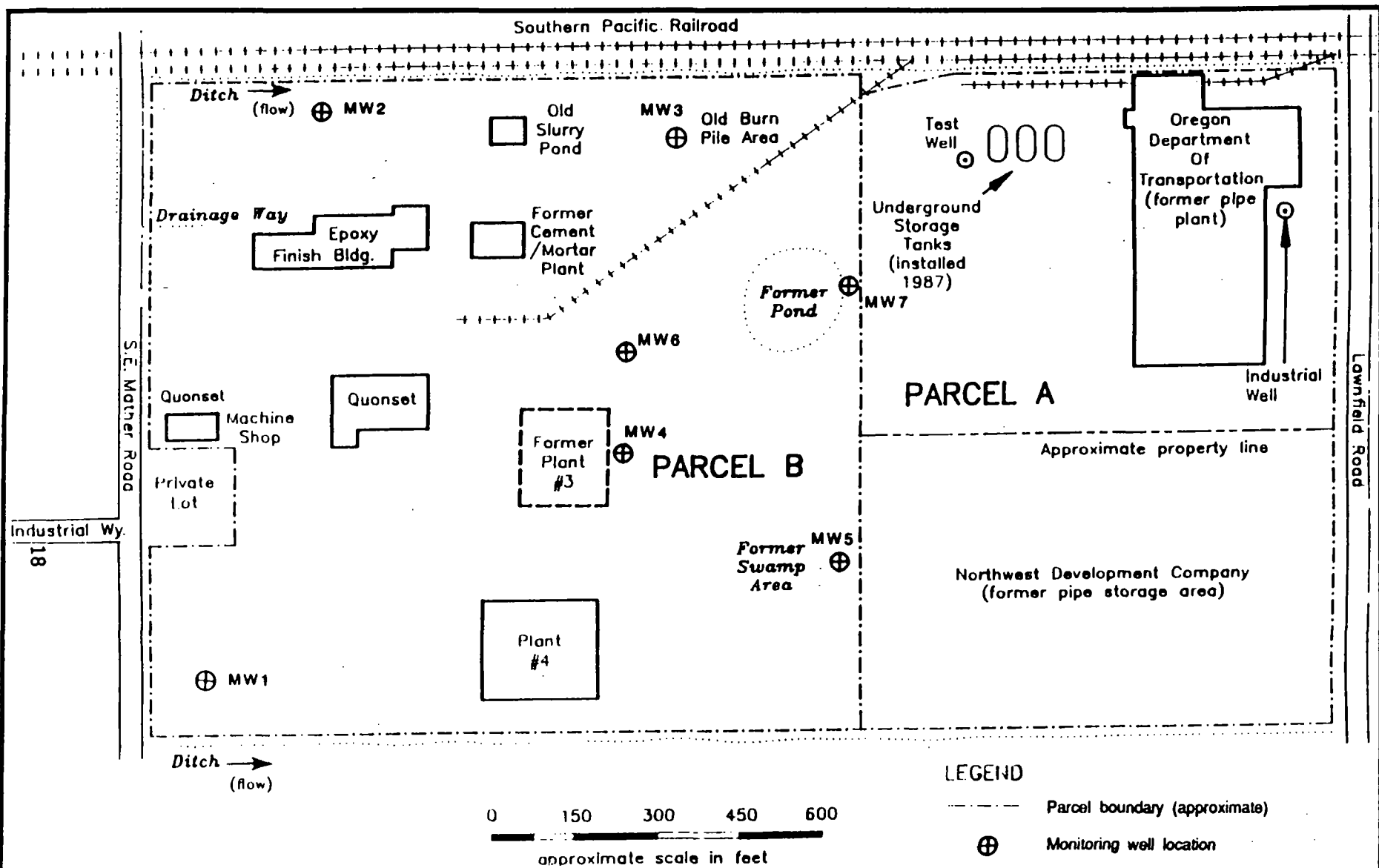
**NORTHWEST PIPE
AND CASING
Clackamas, Oregon**



Source: E & E 1988

**Figure 1
LOCATION MAP**

Drawn By: AES	Date 4-27-93	TDD/Job No. T10-9210-031	Dwg. No. 1451LM
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**NORTHWEST PIPE AND CASING
Clackamas, Oregon**



Source: E & E 1990

**Figure 2
SITE MAP**

Drawn By:
AES

Date
4-27-93

TDD/Job No.
T10-9210-031

Dwg. No.
1452SM

Clackamas River, located one mile south of the site. The Clackamas River is used as a potable water resource in the Clackamas area (E & E 1990).

The site is heavily vegetated with blackberry brambles and small trees or bushes that severely limit line of sight. Paved and gravel roads connect the standing buildings and debris left in the footprints of demolished buildings. The system of roads connects with Mather Road to the south and Industrial Way on the north. Prior to installation of the fence, the NWPC road system was utilized as a short cut between Mather and Lawnfield roads. Solidified coal tar product is evident and abundant throughout the site, particularly in the vicinity of the former Plant 3 building.

2.1.4 Release Threat Posed By Site

Off-site migration of contaminants by the groundwater pathway represents the highest threat of release posed by the site. VOCs, PAHs, and PCBs were detected in shallow on-site wells and similar compounds were detected at lower concentrations in wells located along the downgradient border of the present and former site boundaries. Characteristics of the contaminant source have not been determined and therefore the associated release threat can not be fully evaluated. The source is potentially attributable to leaking buried drums, allegedly buried on site, that may be contributing limited, and possible seasonal, influxes of contaminants. With time and continued deterioration of the rumored drums there may be future container failure that results in a greater pulse of contaminants. Groundwater characteristics of the underlying gravel aquifer may not be sufficient to provide mitigating effects to such a release. Since the quantity and concentration of contaminants in allegedly on-site buried containers is unknown it is not possible to estimate the subsequent effect on groundwater quality. Municipal supply wells are located within one mile of the site.

The surface water pathway also poses a threat of release from the site overland flow of precipitation across the site to the system of site drainage ditches. The tendency of water to pond on the site is indicative of an inability to infiltrate the soils and a shallow depth to the top of the water table. Heavy rainfall events that are common in the Pacific Northwest will, in the absence of infiltration, result in runoff across the site to the ditch system. As the water flows across the site it can erode and carry sediments contaminated with high levels of PAHs. Release of contaminated sediments from the site from surface water runoff is a potential concern.

Direct contact with surface soils poses a release threat to both humans and animals. Contaminated soils and product are prevalent and easily accessible. Past sampling of surface soils have detected VOCs such as TCE and xylene, PCB Aroclor 1254, and a variety of semivolatile heterocyclic and polycyclic aromatic compounds in on-site soils (E & E 1988,90). The fence that surrounds the site is an ineffective security measure. Numerous gaps are present in the fence and holes have been cut to gain access.

Release threat posed by the air pathway is limited to dry summer months. The site has several areas of exposed soils that may dry out and become airborne during the summer months. Concentrations of PAHs in the surface soils are high enough to pose a threat but the majority of the site is well vegetated minimizing the release potential.

2.1.5 NPL Status

As previously discussed, the LSI for the Northwest Pipe and Casing site was completed in June 1990. The LSI resulted in a sufficient Hazard Ranking System (HRS) score for the site to be assigned NPL status on October 14, 1992.

2.2 Actions to Date

2.2.1 Previous Actions and Investigations

NWPC has been the subject of numerous previous actions and investigations. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, NWPC has been the subject of a Preliminary Assessment (PA), an SSI, and an LSI. The PA, SSI, and LSI were used to collect information necessary to generate and substantiate HRS scoring for the site.

Information collected for the HRS scoring package included waste types, waste quantities, and waste releases to the environment. The types of materials handled at this facility included coal tar, coal tar epoxies, pipe primer (bitumastic jet primer containing 70 percent volatile organic compounds in a chlorinated paraffin and rubber base), asphalt, cement mortar, and steel pipe. It is believed that waste products were placed in lagoons or buried on site in drums, the quantity of waste and amount released to the environment is unknown.

On-site soils contained PAHs at concentrations up to 5,800 parts per million (ppm), tetrachloroethene to 3.2 ppm, and PCBs to 1,000 ppm. Groundwater samples from on-site wells contained low concentrations of volatile organic compounds that in concentrated, or pure form are dense non-aqueous phase liquids (DNAPLs), including tetrachloroethene up to 4.2 ppm, and PAHs up to 5.0 ppm. These dilute concentrations indicate the potential presence of immiscible phase DNAPLs. Aroclor 1254 was detected at 15 parts per billion (ppb) in one on-site monitoring well. Lead, chromium, barium, and other heavy metals were also detected at elevated concentrations in groundwater samples from on-site monitoring wells (E & E 1988, 90).

2.2.2 Current Action

2.2.2.1 Sampling Rationale

The TAT was tasked by EPA to determine the need for a removal action at NWPC based on the release threat posed by the site. To determine if contaminants released from the source have migrated

downgradient and pose a threat to the regional groundwater resource, public health and/or the environment, TAT identified four primary objectives.

To confirm groundwater flow direction(s) and determine placement of proposed downgradient wells, the TAT surveyed existing wells, collected groundwater elevations, and constructed a groundwater contour map. Downgradient well placement was determined from this map and drill rig accessibility. To determine the magnitude and extent of downgradient groundwater contamination attributable to the site, TAT installed a total of seven monitoring wells. One in an assumed background location and 6 downgradient of the primary NWPC site. To determine if previously identified geophysical anomalies are attributable to buried sources, TAT excavated on-site test trenches. Finally, to determine the feasibility of on-site excavation of alleged buried waste, TAT conducted a pump test to determine the hydraulic characteristics of the shallow aquifer. Photodocumentation of these activities is included in Appendix A.

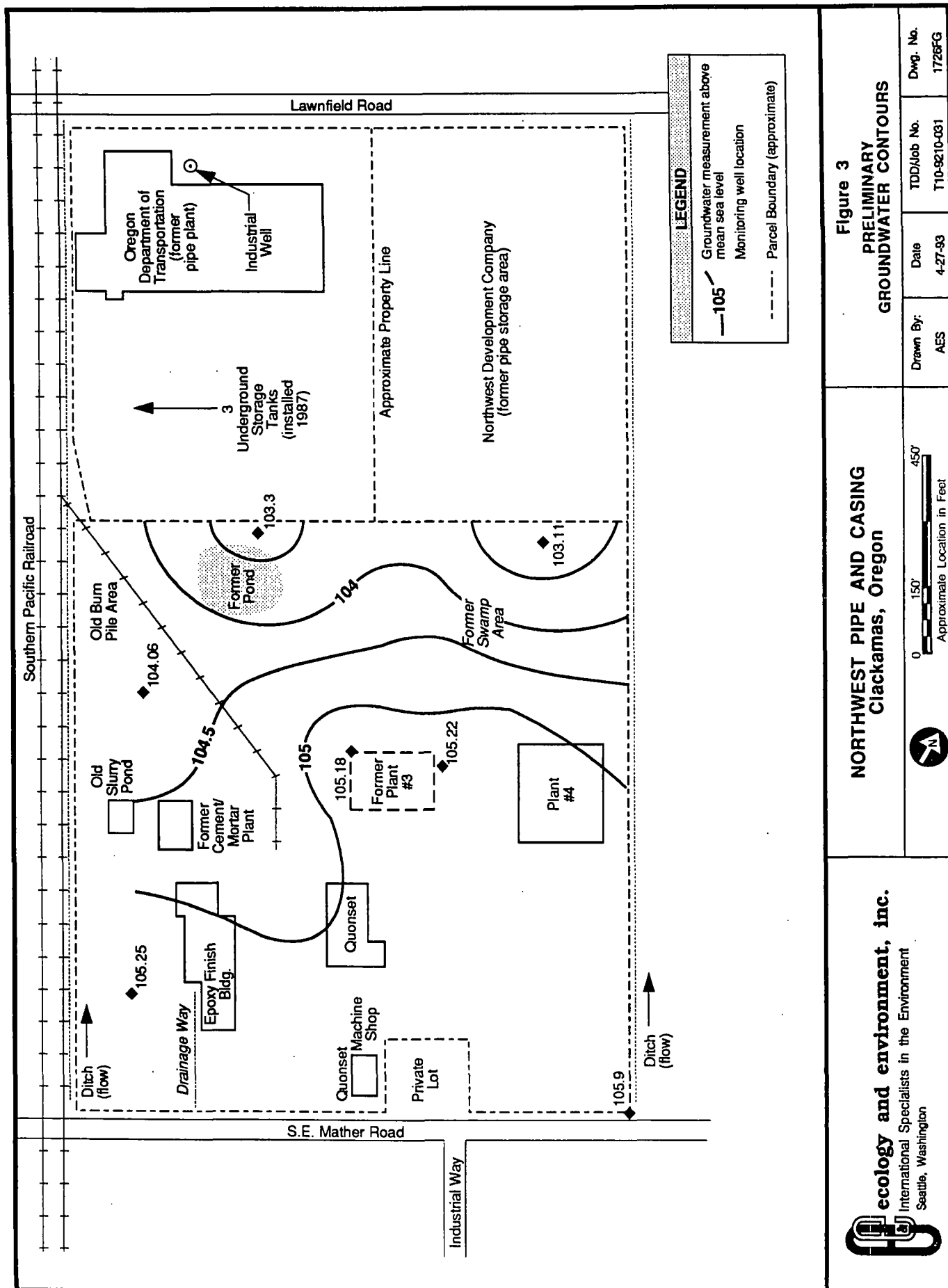
2.2.2.2 Elevation Survey

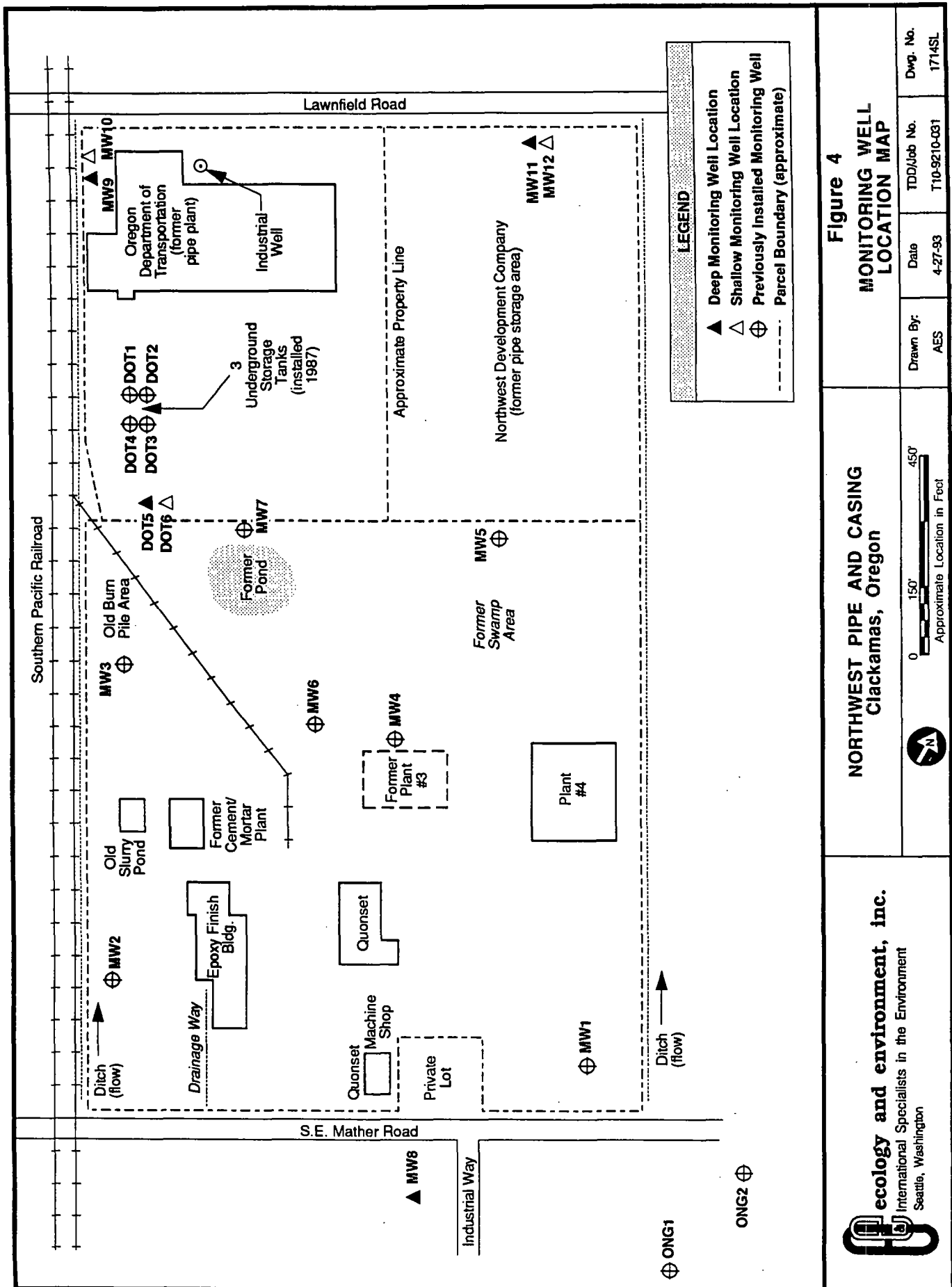
TAT conducted a vertical control survey to evaluate the reliability of existing water level data and groundwater contour maps. Water level elevation data collected during the LSI is presented in Figure 3 (E&E 90). Relative casing elevations of the seven on-site wells, two Oregon National Guard (ONG) Camp Withycombe wells, and four ODOT wells were obtained. Results of the survey, in conjunction with water level measurements taken concurrently at each well, confirmed the general groundwater flow direction illustrated in Figure 3 and dictated monitoring well placement shown in Figure 4.

Following completion and development of TAT monitoring wells, an additional vertical control and water level elevation survey was conducted. The new wells were incorporated into the existing monitoring well network for refinement of groundwater contours. All water level measurements, accurate to 0.01 feet, were collected with an electronic sounder and tape measure in accordance with the established E & E Standard Operating Procedure (E & E 1990a SOP).

2.2.2.3 Monitoring Well Installation

A total of 5 EPA and 2 ODOT monitoring wells were constructed. The EPA wells were designated MW-8 through MW-12 as a continuation of wells MW-1 through MW-7 constructed on-site during the LSI. The ODOT wells are numbered ODOT-5 and ODOT-6 to compliment well designations ODOT-1 through ODOT-4 assigned to existing tank pit wells (Figure 4). As each well was drilled, soil and groundwater samples were collected at 5-foot intervals and screened in the field for the VOCs tetrachloroethene (PCE) and trichloroethene (TCE). Screening was accomplished using a field portable gas chromatograph (GC) operated by TAT chemists. Well screens were placed to monitor at intervals selected based on the analytical data obtained from screening soil and water samples and from interpretation of lithologic conditions encountered while drilling.





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NORTHWEST PIPE AND CASING
Clackamas, Oregon

Figure 4

MONITORING WELL LOCATION MAP

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AES	4-27-93	T10-9210-031	1714SL

The deep wells were installed at depths of approximately 95 to 100 feet below ground surface (bgs), no VOCs were detected in the lower portions of these boreholes. Screen intervals were selected based on lithology and contaminant characteristics. Zones just above the deepest transition from gravel to fine-grained lithology were selected for monitoring in an effort to intercept the DNAPL contaminants as they move downward toward the base of the gravel aquifer. The more shallow installations were constructed at depths corresponding to detection of contaminants by field screening.

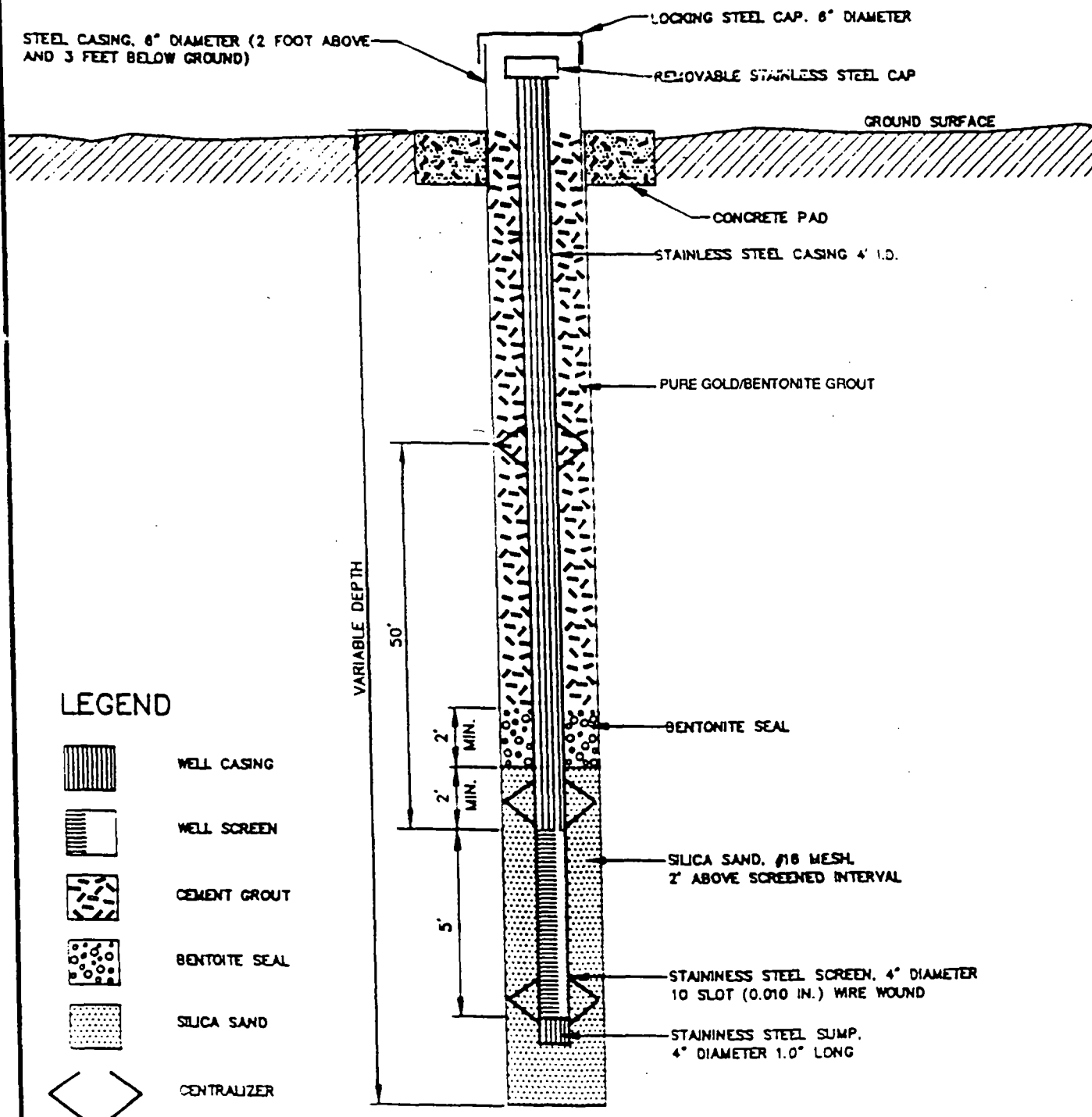
The monitoring wells were constructed of clean, 4-inch inside diameter (I.D.), type 304 stainless steel casing with matching sump, screen, and casing. All casing segments include flush threaded joints with O-rings. The well screens are a manufactured 10-slot (0.010-inch) wire wound type screen, 5 feet in length. Stainless steel centralizers were installed at the bottom and top of the screened intervals and an additional centralizer was installed 50 feet above the top of the screen in the deeper wells. The sand pack consists of clean, 10-20 mesh graded silica sand from one foot below the bottom of the screened interval to 2 feet above the top of the screen. A 2-foot thick bentonite plug was set on top of the sand pack. High solids bentonite grout (PureGold) was then tremied from the top of the bentonite plug to ground surface. A PureGold mixer was used to hydrate to a 30% solids slurry. Each batch of grout was weighed with a mud balance prior to placement to ensure recommended density was achieved.

Below grade monitoring well boxes were used to complete all the wells except MW-8, which was completed with a 6-inch steel protective casing. All below grade installations were cemented in place, appropriately designated and the well casings fitted with locking caps. MW-8 was completed using a cement pad and locking cover for the 6-inch protective casing. A generalized monitoring well construction diagram is shown in Figure 5 and screened intervals are given in Table 1.

2.2.2.4 Geology

NWPC is located on a relatively level alluvial flood plain north of the Clackamas River. The site is underlain by Quaternary Age alluvial sediments. These sediments consist of silty sands, silts, clays, and gravels (E & E 1988, 90). Regionally, these deposits unconformably overlie fluvial terrace deposits consisting of poorly sorted gravels with minor sand and silt lenses. Underlying the terrace deposits are discontinuous lava flows (Boring Lavas), well-indurated sandstones and conglomerates of the Troutdale Formation, and older clays and silts of the Sandy River Mudstone unit. In the vicinity of the site these units are mapped as unconformably overlying Tertiary age Columbia River Basalts (USGS 1983, 1989).

Geologic logs compiled by E & E during field activities at NWPC indicate that in the vicinity of the site the shallow subsurface consists of interbedded silts, clays, sands, and gravels. These interbeds extend to a depth of about 10 feet bgs in the northern wells (MW-9, -10, -11, and -12) and about 8 feet bgs in the southernmost well



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 Seattle, Washington

**NORTHWEST
 PIPE AND CASING
 Clackamas, Oregon**

NOT TO SCALE

**Figure 5
 GENERALIZED MONITORING
 WELL CONSTRUCTION**

Drawn By:	Date	TDD/Job No.	Dwg. No.
EGM	4-27-93	T10-9210-031	FIG-5

TABLE 1

GROUNDWATER MONITORING WELL SCREENED INTERVAL
BELOW GROUND SURFACE
NORTHWEST PIPE AND CASING
CLACKAMAS, OREGON

MONITORING WELL	SCREENED INTERVAL (FEET BGS)
MW-8	66.0 - 71.0
MW-9	79.5 - 84.5
MW-10	28.5 - 33.5
MW-11	60.0 - 65.0
MW-12	33.0 - 38.0
ODOT-5	95.0 - 100.0
ODOT-6	14.0 - 19.0

(MW-8). The lithology grades to an increasingly gravel rich deposit for approximately 5 to 7 feet below the interbeds. Detailed Geologic Logs are presented in Appendix B.

Underlying these shallow deposits are well graded, fine- to coarse gravels that extend to depths of at least 95 to 100 feet. Minor sand/silt zones, or lenses, were occasionally noted within the gravel. The lenses were generally one or two feet thick with gravel remaining the dominant feature of the sample, at greater than 50 percent.

2.2.2.5 Hydrology

The shallow interbedded sequence of silts, clays, sands, and gravels contain both saturated and unsaturated zones that may, depending on the screened material, yield small quantities of groundwater. These conditions are substantiated by geologic logs and groundwater yields of on-site shallow wells constructed to depths of 7 to 15 bgs for the LSI.

The presence of the underlying gravel aquifer at shallow depths may impact the ability to easily excavate on-site to investigate the areas of geophysical anomalies. Excavation is necessary to confirm the allegations of buried waste and to subsequently remove the sources. Excavation is limited by the high yield of the aquifer, pump capacity required to maintain a relatively dry excavation, and the ability to treat recovered water. To estimate the production capacity of the aquifer, TAT conducted a pump test utilizing an on-site well. Transmissivity was estimated at 3,000 gallons per day per foot (gpd/ft) from a specific capacity test conducted on MW-3. This well was selected based on historic data and TAT field screening that indicated it was the least contaminated of the on-site wells. It is also screened within a zone of increasing gravel content, 11 to 16 feet bgs, and as a result is presumably one of the more productive on-site wells.

No aquifer test data was collected at the deeper off-site wells due to the significant amount of purge water that would have to be contained and treated as investigation derived waste. However, during drilling of these wells the observed groundwater production capacity indicates that this is a high yield aquifer. The relatively low transmissivity noted at mw-3 is most likely not indicative of conditions in the gravel aquifer nor of conditions within the shallow aquifer across the site. The inferred high yield of this lower gravel aquifer is likely providing dilution and dispersion effects that may significantly reduce contaminant concentrations within the aquifer.

The relationship between the shallow and deeper gravel aquifers has not been determined, but analytical data indicates that contaminants associated with NWPC are also present in wells at the downgradient boundary of the site. Wells MW-10 and -12 are constructed within the upper portion of the gravel aquifer at depths of 35 and 40 feet bgs respectively. Field screening analytical results indicate these wells are contaminated with low concentrations of contaminants associated with NWPC.

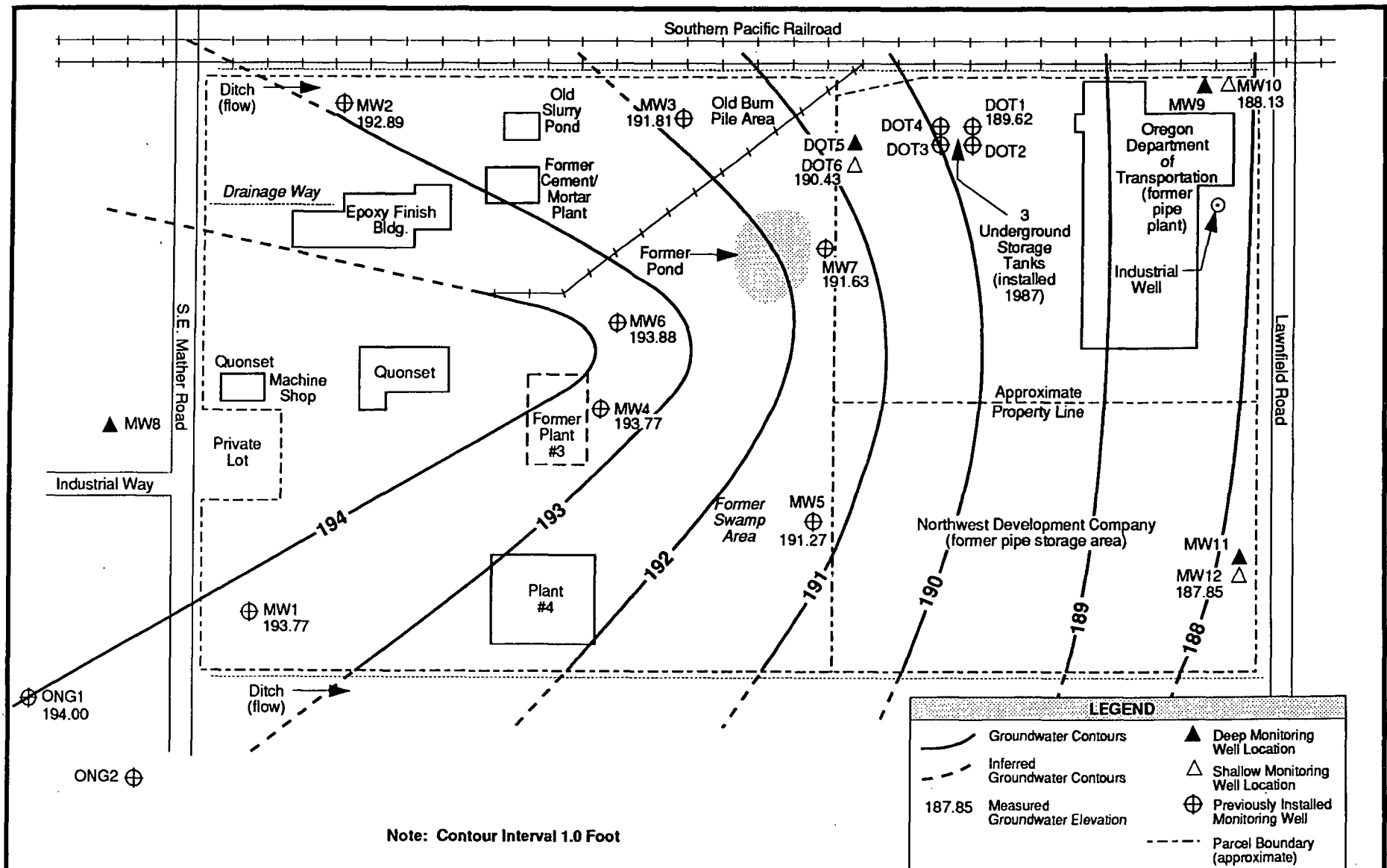
After all monitoring wells were installed, developed, and completed the TAT conducted a vertical control survey to tie the new wells into the existing network of surveyed wells. TAT then collected a final round of groundwater elevation data from MW-1 through MW-12, ODOT-1 through ODOT-6, and ONG-1 and ONG-2 on November 19, 1992. This data was used to generate the contoured groundwater elevation maps illustrated in Figures 6 and 7. These maps indicate that groundwater flows to the northwest within the gravel aquifer although the gradient apparently varies with depth indicating a vertical component of flow.

2.2.2.6 Field Screening

Field analysis of soil and groundwater samples collected during drilling operations was determined to be the most efficient and effective means of identifying optimal zones for groundwater monitoring. After review of available site information, TAT determined that dilution and dispersion effects would result in downgradient contaminant concentrations below the detection limits of conventional field screening instrumentation.

TAT identified and procured instrumentation capable of meeting the needs of the project. TAT selected the field portable Sentex Systems Scentograph GC with an argon ionization detector coupled with a purge and trap unit. TAT modified Region 10 Field Analytical Support Project (FASP) method F080.001 to the Sentex operating parameters. All FASP method quality control were met for initial calibration, continuing calibration, final calibration, and quantitation limits. The compounds TCE and PCE were selected as target analytes. Detection limits of 5 ppb were obtained with a sample preparation and run time of approximately 5 minutes. Initial field calibration was verified using samples collected from MW-2, MW-4, and MW-6 which previous sampling had documented PCE and TCE. Approximately 10 percent of the field analyzed samples were submitted for laboratory confirmation with acceptable correlation. A detailed description of the field screening methodology, results, and correlation to laboratory results is provided as Appendix C.

A total of 52 borehole soil samples and 68 groundwater samples were analyzed by the portable GC to optimize well screen placement. Low levels of TCE, ranging from 3 ppb to 9 ppb, were detected in groundwater samples collected from 30 to 45 feet below ground surface while boring MW-9. To capture this zone of contamination the shallow well MW-10 was screened from approximately 30 to 35 feet bgs. Tetrachloroethene (PCE) contamination was identified in well ODOT-5 by the field GC. At 15 feet bgs the PCE concentration in groundwater was an estimated 2 ppb. PCE was detected in the soil and groundwater 35 feet bgs at estimated concentrations of less than 1 ppb. An estimated concentration of 3 ppb PCE was identified in groundwater obtained from 45 feet bgs while drilling ODOT-5. Monitoring well ODOT-6 was constructed and screened at an approximate depth of 15 to 20 feet bgs to capture this zone of contamination in the upper aquifer. No contaminants were detected during installation of MW-8, MW-11, and MW-12.



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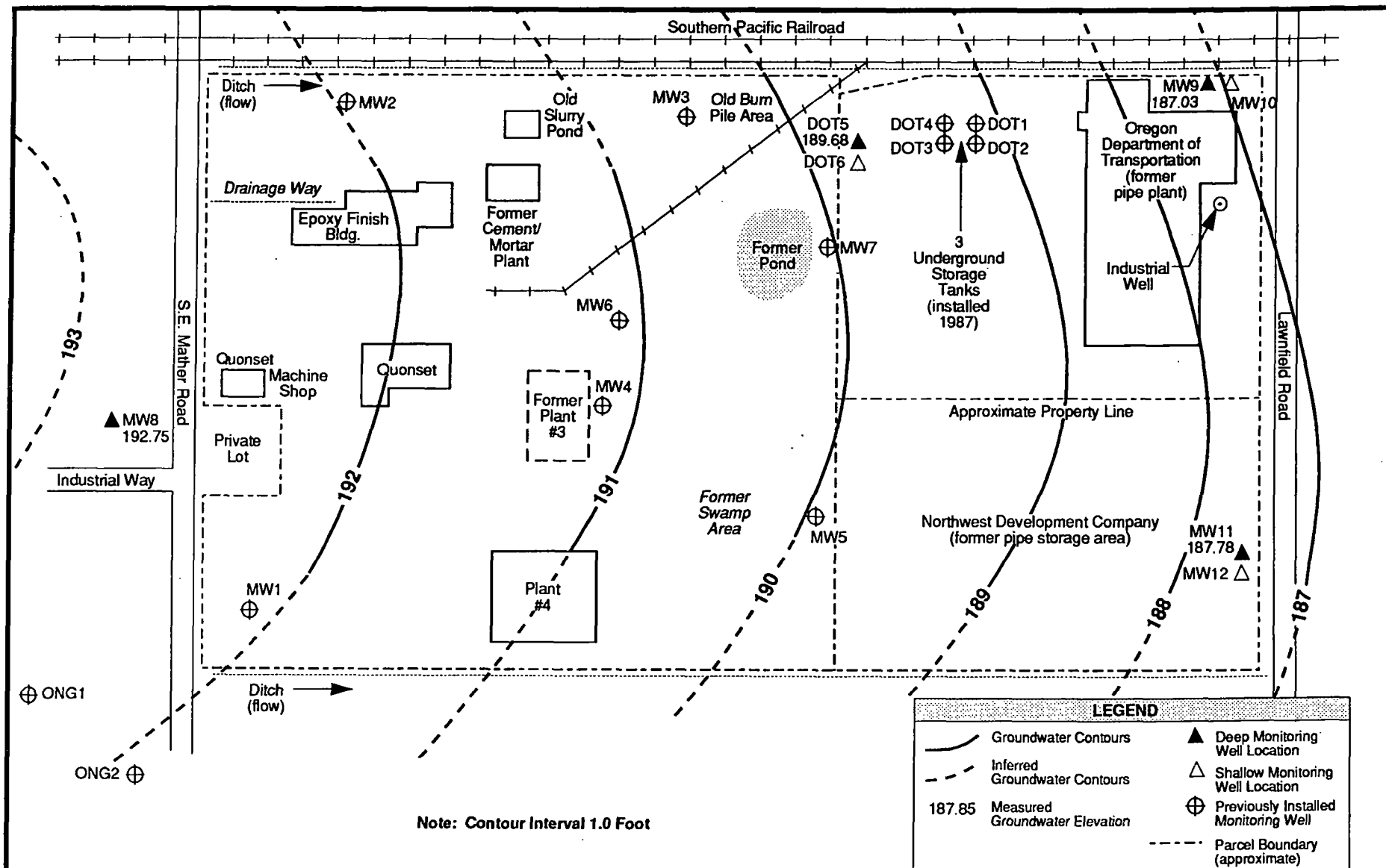
NORTHWEST PIPE AND CASING Clackamas, Oregon



0 150' 450'
Approximate Location in Feet

Figure 6
APPROXIMATE GROUNDWATER ELEVATIONS
SHALLOW WELLS
November 19, 1992

Drawn By:	Date	TDD/Job No.	Dwg. No.
AES	4-27-93	T10-9210-031	1715FG



Note: Contour Interval 1.0 Foot



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Seattle, Washington

NORTHWEST PIPE AND CASING Clackamas, Oregon



0 150' 450'
Approximate Location in Feet

Figure 7
APPROXIMATE GROUNDWATER ELEVATION
LOWER GRAVEL AQUIFER
November 19, 1992

Drawn By:	Date	TDD/Job No.	Dwg. No.
AES	4-27-93	T10-9210-031	1716FG

These field screening analysis indicate low concentrations of TCE were detected in groundwater samples from 15 to 45 feet bgs along the downgradient border of former site operations. Field screening results for TCE are given in Table 2, and complete field screening results and procedures are presented in Appendix C.

2.2.2.7 Sampling Results

Following installation, completion, and development each well was sampled and submitted for laboratory analysis. Groundwater samples were collected, handled, and analyzed, and results were reported per the TAT Sampling Plan/Quality Assurance Project Plan for NWPC. A quality assurance review of the analytical results performed by E & E TAT chemists is presented in Appendix D along with a key that identifies TAT sample numbers and their corresponding sample location numbers. In general, the data were judged to be acceptable, except where flagged with qualifiers which modify the usefulness of individual values.

Groundwater samples were collected from all seven monitoring wells and from three on-site trenches. All samples were analyzed for volatile organic compounds, semivolatile organic compounds, pesticides/PCBs, and inorganic compounds. A summary of laboratory analytical results is presented in Table 3 for groundwater monitoring wells and Table 4 for on-site trench samples.

Monitoring Well Sample Results

The single volatile organic analyte detected in laboratory analysis of groundwater samples was trichloroethene (TCE) at 3.0 ppb in ODOT-6. This shallow well is located on Parcel A, formerly land used as part of NWPC operations, near the fence that delineates the present site boundary. Tetrachloroethene (PCE) was not detected in any of the off-site groundwater samples either by laboratory or field screening analysis. Semivolatile organic compounds were detected at low concentrations in all the monitoring wells including the background well MW-8. Phthalates and PAHs are the predominant contaminants detected. A summary of groundwater analytical results is presented in Table 3.

Soil samples collected while drilling at the screen interval in MW-8, MW-9, MW-11 and ODOT-5 and submitted for laboratory analysis indicate the presence of phthalates. Complete analytical results are given in Appendix D.

Phthalates are common compounds associated with degradation of plastic materials. Their presence in the background well suggests the potential of an upgradient source of this contaminant in addition to NWPC. The PAHs identified in the groundwater are common constituents of coal tar and likely associated with the NWPC site. No pesticides/PCBs were detected in any of the groundwater samples. Elevated concentrations of the inorganic compounds chromium, copper, lead, nickel, and zinc were detected in five of the seven wells. The nickel concentration in ODOT-6 exceeds the Maximum Contaminant Level (MCL) established by the EPA.

TABLE 2
FIELD SCREENING RESULTS FOR TCE
SHALLOW SOILS AND GROUNDWATER
NORTHWEST PIPE AND CASING
CLACKAMAS, OREGON
(ppb)

Sample Depth (bgs)	MW-8	MW-9/10	MW-11/12	ODOT-5/6
10' - Soil	ND	ND	ND	ND
- Water	NA	ND	ND	ND
15' - Soil	ND	NA	ND	2 F
- Water	NA	ND	ND	ND
20' - Soil	ND	ND	ND	ND
- Water	NA	ND	ND	ND
25' - Soil	ND	NA	ND	ND
- Water	NA	NA	ND	ND
30' - Soil	ND	ND	NA	ND
- Water	NA	7 F	ND	NA
35' - Soil	ND	ND	ND	<1 F
- Water	NA	ND	ND	<1 F
40' - Soil	ND	ND	NA	ND
- Water	NA	3 F	ND	ND
45' - Soil	ND	NA	NA	ND
- Water	NA	9 F	ND	3 F
30' - Soil	ND	NA	NA	ND
- Water	NA	ND	ND	ND

ND - Not detected

NA - Not analyzed

F - Data have been generated using FASP methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

TABLE 3

ANALYTICAL RESULTS OF OFF SITE GROUNDWATER SAMPLING
NORTHWEST PIPE AND CASING
CLACKAMAS, OREGON
NOVEMBER 1992
(ppb)

Analyte	NW-8	NW-9	NW-10	NW-11	NW-12	ODOT-5	ODOT-5 (Duplicate)	ODOT-6
Volatile Organics								
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	3.0 J
Semi-Volatile Organics								
Di-n-butylphthalate	2	ND	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthal	37 J	8 J	11	53 J	36 J	31 J	ND	10
Acenaphthene	ND	ND	10	ND	ND	2 J	ND	40
Di-n-octylphthalate	ND	ND	ND	ND	3 J	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	ND	ND	ND	16
Fluorene	ND	ND	ND	ND	ND	ND	ND	13
Phenanthrene	ND	ND	ND	ND	ND	ND	ND	9 J
Fluoranthene	ND	ND	ND	ND	ND	ND	ND	8 J
Pyrene	ND	ND	ND	ND	ND	ND	ND	7 J
Pesticides/PCBs								
None detected	ND	ND	ND	ND	ND	ND	ND	ND
Inorganics								
Arsenic	ND	ND	11.1	ND	ND	ND	ND	ND
Chromium	69.4	ND	41.0	ND	80.1	ND	11.6	980
Copper	ND	ND	71.8	ND	ND	29.0	ND	46.6
Lead	3.1	ND	23.2	ND	ND	5.8	ND	4.7
Nickel	ND	ND	44.8	ND	72.6	ND	ND	597
Zinc	ND	ND	110	ND	106	43.2	ND	25.9

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.

ND - Not detected

Trench Sample Results

Groundwater samples collected from shallow trenches excavated during this project indicate a significant variation in on-site groundwater quality (Table 4). A total of 4 trenches, designated T-1 through T-4, were excavated from 6.5 to 8.5 feet bgs. Trench locations are illustrated in Figure 8 and soil profiles are included in Appendix B. No contaminants were detected in the sample collected from T-1 and no sample was collected from T-3 due to insufficient groundwater and lack of visible contamination.

Trench sample T-2 contained a wide range of high concentration semivolatile and low concentration inorganic contaminants. Semivolatile contaminants are primarily PAHs consistent with products known to have been used on-site. Naphthalene was detected at 4,000 ppb, Acenaphthene at 6,200 ppb, Dibenzofuran at 3,500 ppb, Phenanthrene at 6,700 ppb, and Fluoranthene at 4,500 ppb. Nine of the thirteen priority pollutant metals are present at elevated concentrations in sample T-2. Trench sample T-4 contained similar contaminants at much lower concentrations. These trench sample results and the debris and oily sheen observed in two of the trenches may indicate the presence of buried waste at the NWPC site.

2.2.2.8 Investigation Derived Waste

Groundwater and drill cuttings generated during drilling operations, monitoring well construction, and groundwater sampling at NWPC were contained and stored on site. Analysis of samples collected from the Investigation Derived Wastes (IDW) did not indicate the presence of hazardous materials. The drill cuttings were removed from the drums, the drums cleaned, and then removed from the site. Two tanks used to store the water portion of the IDW were drained to a low section of the site, cleaned out and removed from the site.

2.3 State and Local Authorities Role to Date

The State of Oregon Department of Environmental Quality (DEQ) has demonstrated an active interest in the NWPC site. DEQ has monitored groundwater elevations since NWPC was assigned NPL status. DEQ has demonstrated cooperation with the TAT investigation by providing groundwater elevations and other requested information. TAT provided DEQ with a debriefing of activities completed during the investigation. Preliminary copies of TAT drilling and sampling logs were provided to DEQ at their request and under the direction of the On-Scene Coordinator (OSC).

3.0 PUBLIC HEALTH AND ENVIRONMENTAL THREATS

3.1 Threats to Public Health and Welfare

The NWPC site presents a potential threat to public health and welfare through several mechanisms. There is a high potential for direct contact with contaminated on-site soils. This threat is

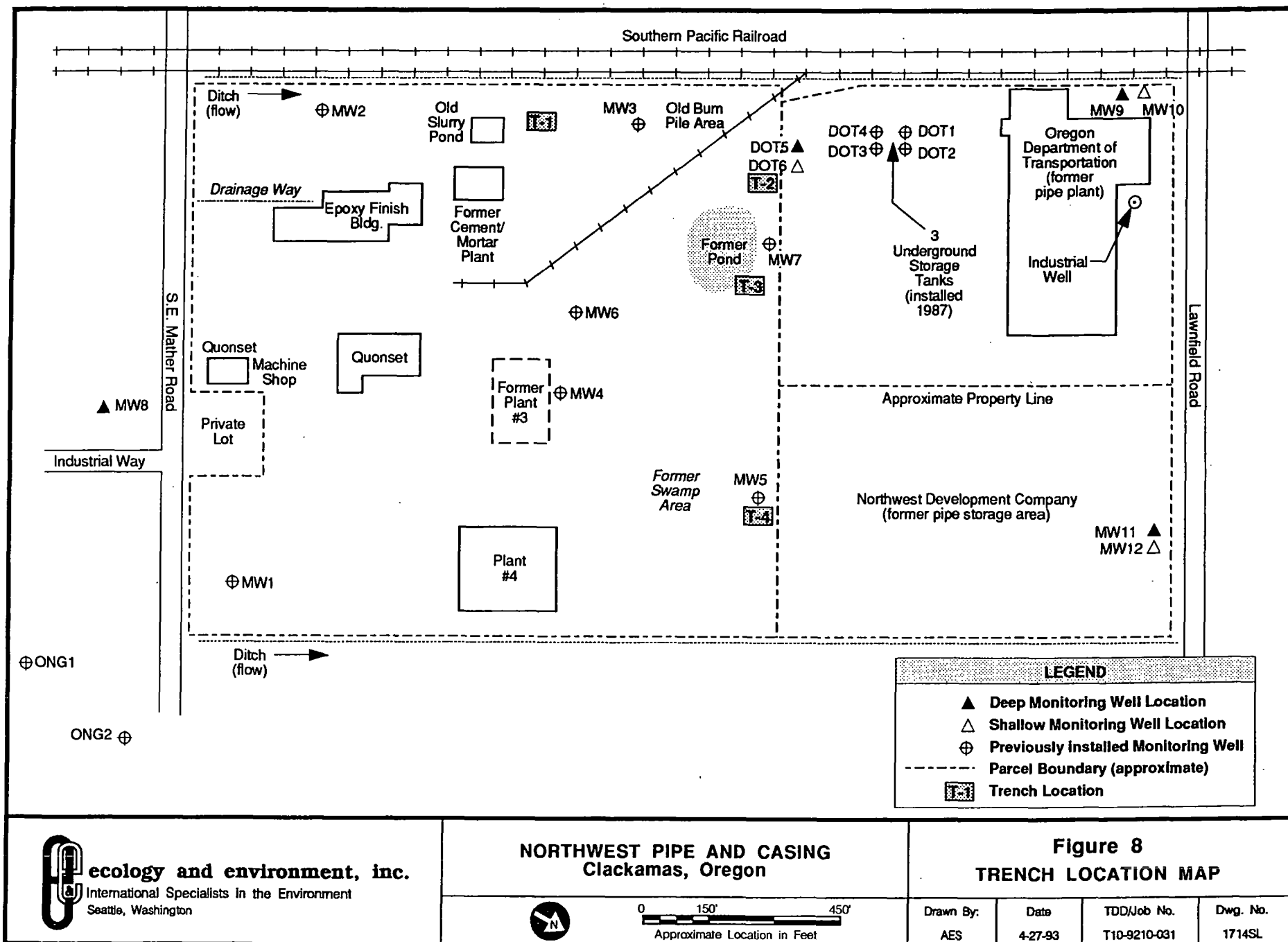
TABLE 4
ANALYTICAL RESULTS OF TRENCH WATER SAMPLES
NORTHWEST PIPE AND CASING
CLACKAMAS, OREGON
NOVEMBER 1992
(ppb)

Analyte	T-1	T-2	T-3	T-4
Volatile Organics				
Vinyl Chloride	ND	ND	*	37
Semi-Volatile Organics				
Napthalene	ND	4,000		2 J
2-Methylnapthalene	ND	1,100		ND
Acenaphthene	ND	6,200		25
Dibenzofuran	ND	3,500		10
Fluorene	ND	2,900		37
Phenanthrene	ND	6,700		68
Anthracene	ND	500 J		84
Fluoranthene	ND	4,500		16
Pyrene	ND	3,200		17
Benzo(a)anthracene	ND	460 J		ND
Chrysene	ND	470 J		5 J
Benzo(b)fluranthene	ND	200 J		ND
Pesticides/ PCBs				
None detected	ND	ND		ND
Inorganics				
Antimony	ND	ND		81.3
Arsenic	ND	14.7		ND
Cadmium	ND	5.0		ND
Chromium	ND	76.4		29.4
Copper	ND	141		46.4
Lead	ND	23.4		9.4
Mercury	ND	0.26		ND
Nickel	ND	60.6		ND
Zinc	21.3	352		277

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.

ND - Not detected

* No visable contamination, no sample collected.



particularly high among vagrants, teenagers, and children that are attracted to the abandoned buildings and have little difficulty gaining access through the vandalized fence.

Public health and welfare could be threatened by the potential contamination of potable groundwater resources. Analytical data indicates the presence of multiple on-site sources and that releases from those sources have occurred. The transmissive nature of the aquifer complicates interpretation of the source release mechanism and the magnitude of potential groundwater quality impact. A steady state release condition may exist or deteriorating conditions may result in a significant release within a finite time frame. Such a release, although physically unlikely has the potential to exceed the dilution capacity of the aquifer and threaten downgradient drinking water resources.

Surface water and associated mechanisms may also threaten public health. Surface water runoff may result in the transportation of contaminated soils to previously unaffected locations presenting an unknown and unanticipated threat to those that may come in contact with the soil. Site runoff also poses a public threat through potential contamination of surface waters used for recreational resources.

3.2 Threats to the Environment

On-site contamination presents a potential threat to the environment through direct contact and ingestion of soils and coal tar by animals that may forage on the easily accessible property. Water fowl was observed to congregate on the ponds of standing water located through out the site. Surface water runoff from the site is likely to occur due to the low rate of infiltration apparent at the site. As a result contaminants can be transported off-site as part of the suspended sediment load or as dissolved constituents of the runoff. This potential poses a threat to the quality of the water in downgradient rivers such as the Clackamas. The sensitive riverine environment and associated plants and animals are also threaten by this potential runoff.

The most significant environmental threat posed by the NWPC site is the potential impact to a large regional groundwater resource. If the source of dilute DNAPL compounds documented in on-site wells were to undergo a large scale release, remediation efforts and costs would increase significantly. Characteristics of DNAPLs decrease the potential for recovery from groundwater once released. Source identification and removal is essential to reduce environmental impact.

3.3 Status and Regulatory Authorities

The NWPC site was assigned NPL status on October 14, 1992. EPA has authority under CERCLA to investigate, and remediate if necessary, hazardous waste sites that pose a threat to public health and environmental quality. Past and present site owners have been identified as Potentially Liable Parties as part of the LSI.

4.0 ENDANGERMENT DETERMINATION

Allegations of buried waste were substantiated by the TAT investigation. Trench excavation conducted on site was exploratory and not invasive, and as a result avoided geophysical anomalies indicative of buried metal drums or debris. Excavation did establish that migration of semivolatile and inorganic contaminants away from the source has occurred. Additionally, the low concentrations of VOCs detected in downgradient wells suggests that migration has occurred away from the source as well as substantial dilution.

Although a release has apparently occurred, the impact to downgradient receptors is diminished by dilution and dispersion effects. Continued confidence and reliance on dilution and dispersion to mitigate the threat the public health or welfare and the environment is dependent on identification of the source and release mechanism.

The potential degradation of alleged buried containers pose the threat of release of hazardous substances in sufficient quantity to exceed the dilution effects of the aquifer. Such a release may present and imminent and substantial endangerment to public health, or welfare, and the environment. Identification, characterization, and removal of sources to the extent practicable is recommended for further consideration in order to reduce potential for environmental impact.

5.0 CONCLUSIONS

NWPC, a Superfund NPL site, is a former pipe coating and manufacturing facility located in Clackamas, Oregon. The site was active for approximately thirty years until closed in 1986.

Seven groundwater-monitoring wells were installed using recently developed field analysis equipment and techniques to determine the optimal depths for screen placement.

Groundwater flow at NWPC is to the northwest. The site is underlain by a gravel aquifer used as a potable water resource. Contaminants were detected in groundwater monitoring wells along the present and former border of site operations. Potential for degradation of local groundwater quality exists as a result of the elevated concentrations and uncertain quantities of on-site contaminants.

The shallow lithology at NWPC is variable in thickness and transmissivity across the site. The underlying gravel aquifer has, apparently, a sufficient capacity to impact excavation efforts below the depth at which it is encountered

Quarterly monitoring of water level elevations should be conducted and a data base established to determine if data collected during this assesment is representative of conditions throughout the year.

On-site excavation indicated the presence of buried wastes and contaminated groundwater.

Direct contact is of concern due to lack of site security and evidence of transient occupancy.

REFERENCES

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- United States Geologic Society (USGS), 1983, Groundwater in the Northern Part of Clackamas County, Oregon, Open File Report 80-1049.
- United States Geologic Society (USGS), 1989, Lithology, Thickness and Extent of Hydrologic Units Underlying the East Portland Area, Oregon Water Resources Investigation Report 88-4110.

APPENDIX A
PHOTOGRAPHIC DOCUMENTATION

PHOTOGRAPH IDENTIFICATION SHEET

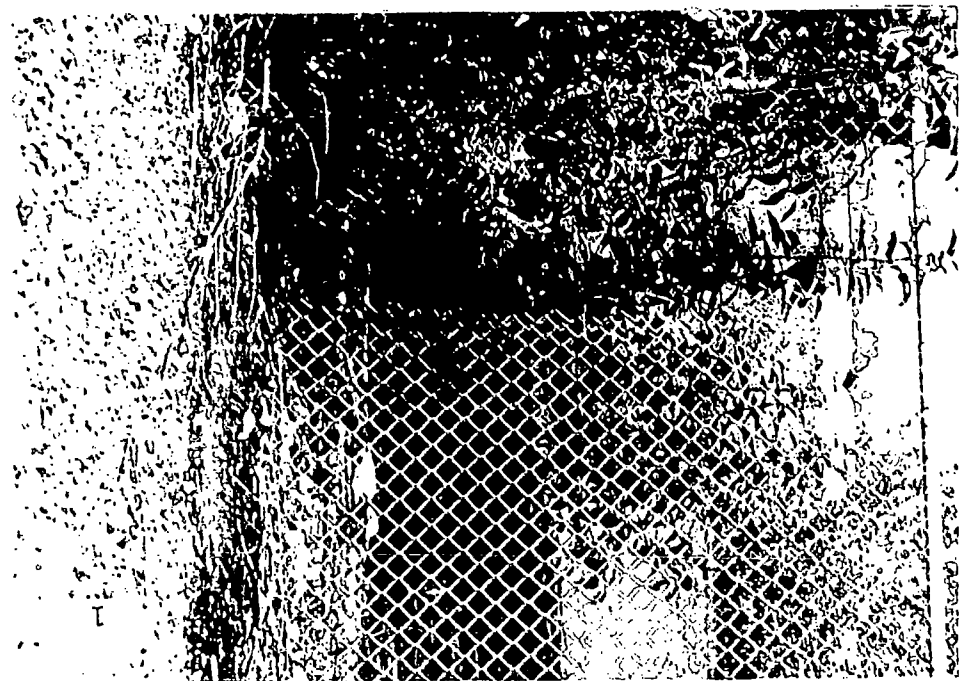
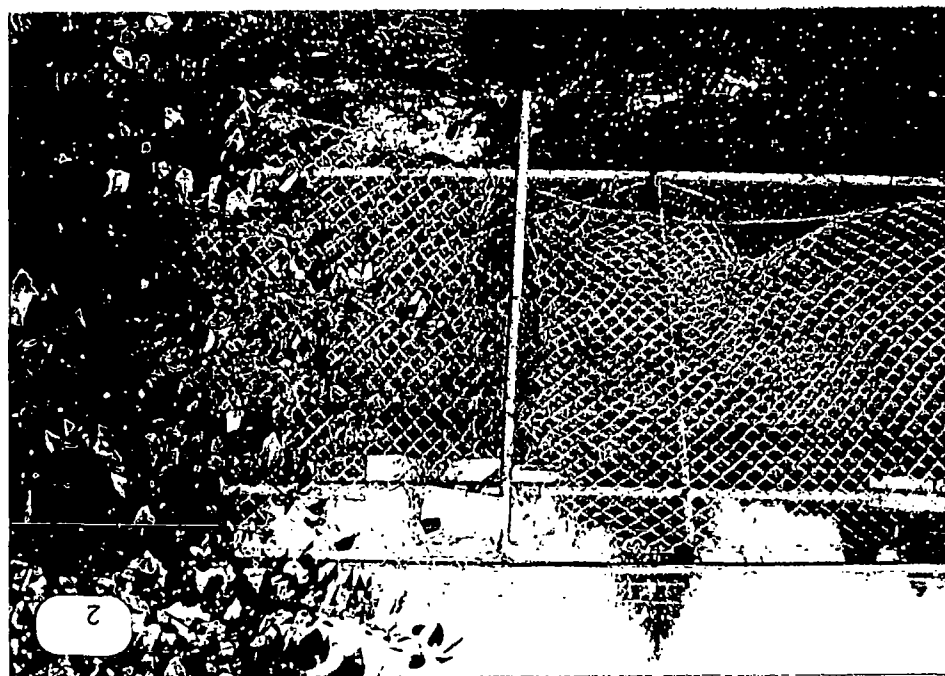
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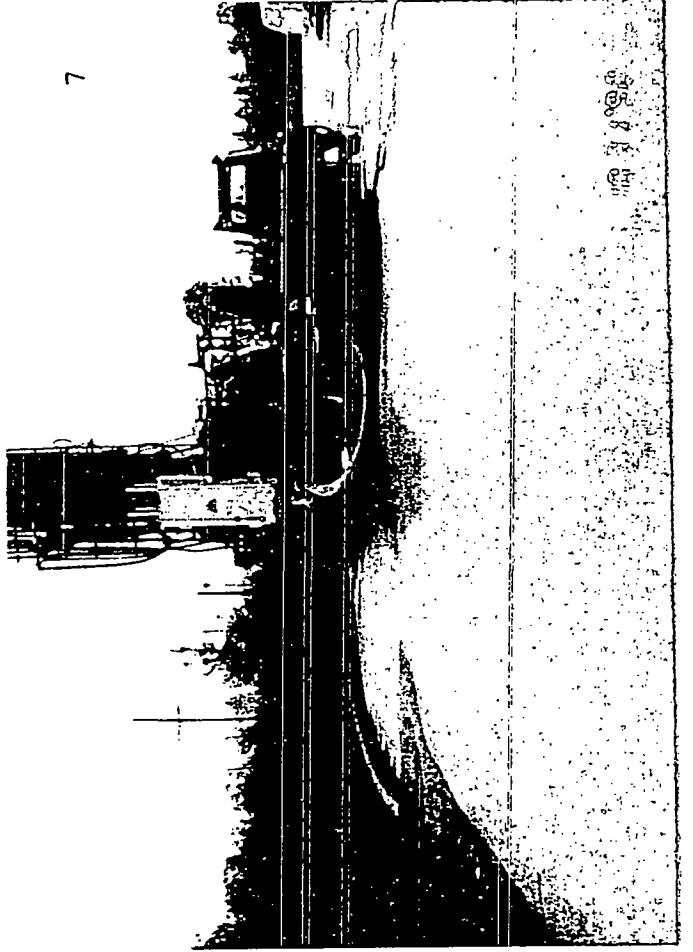
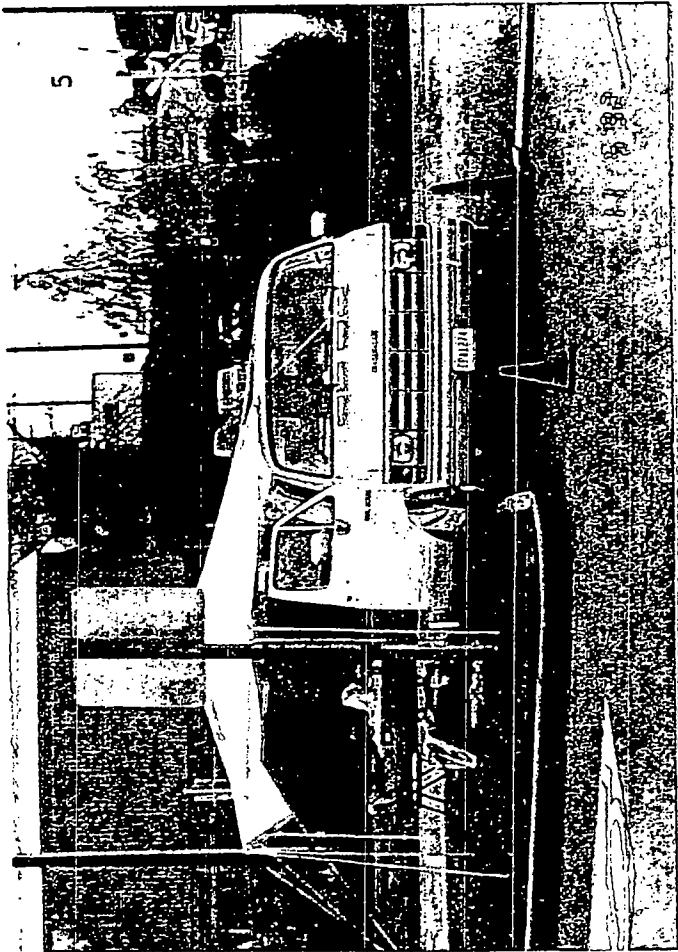
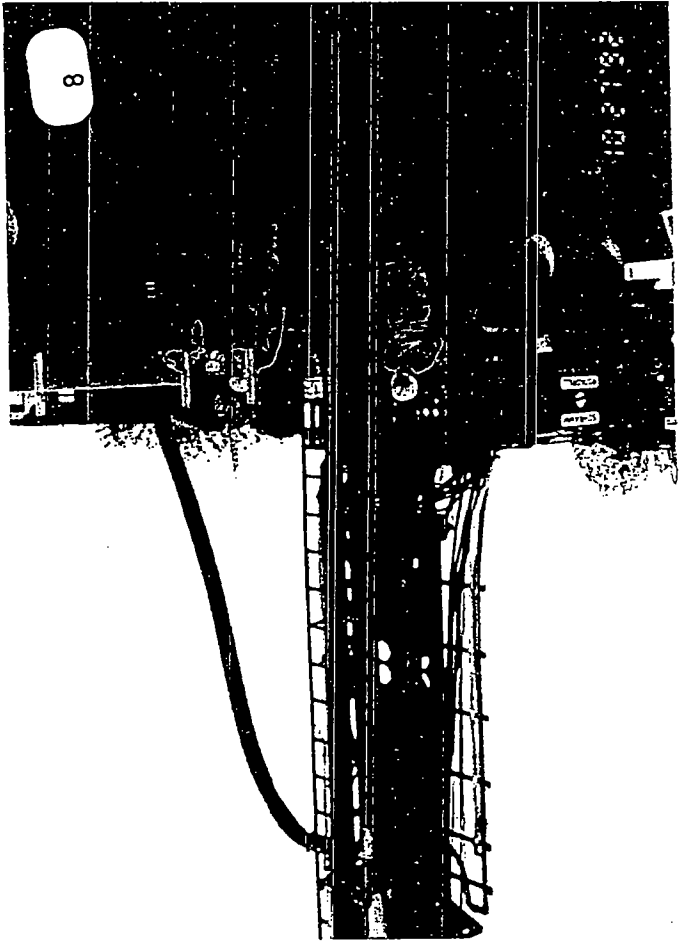
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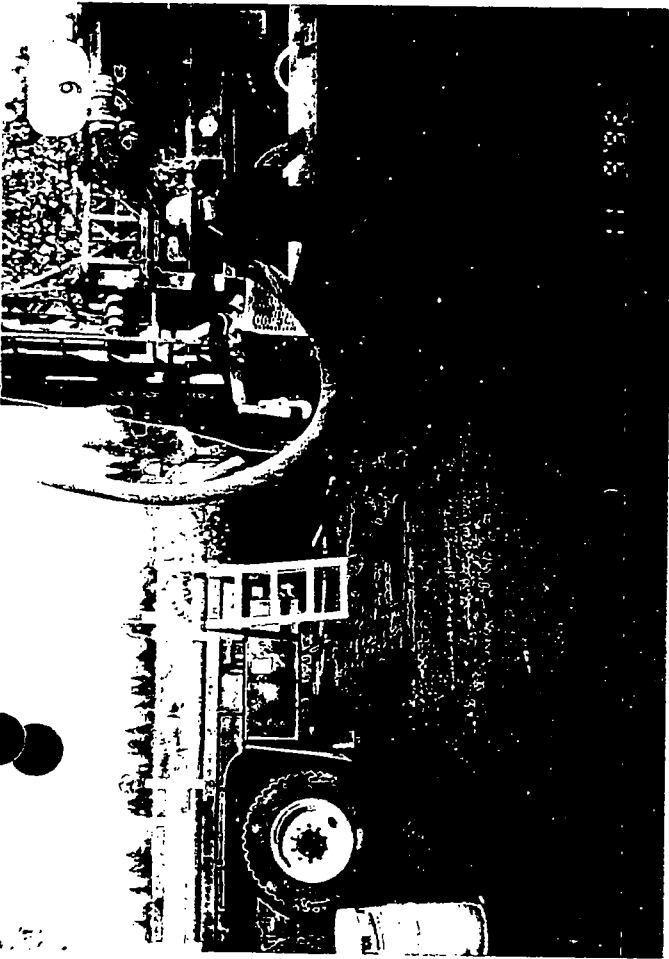
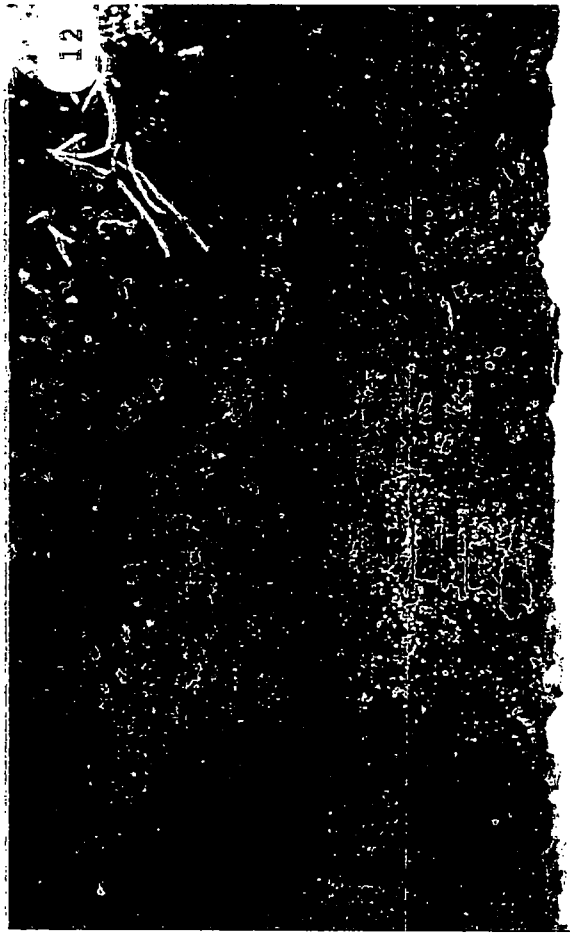
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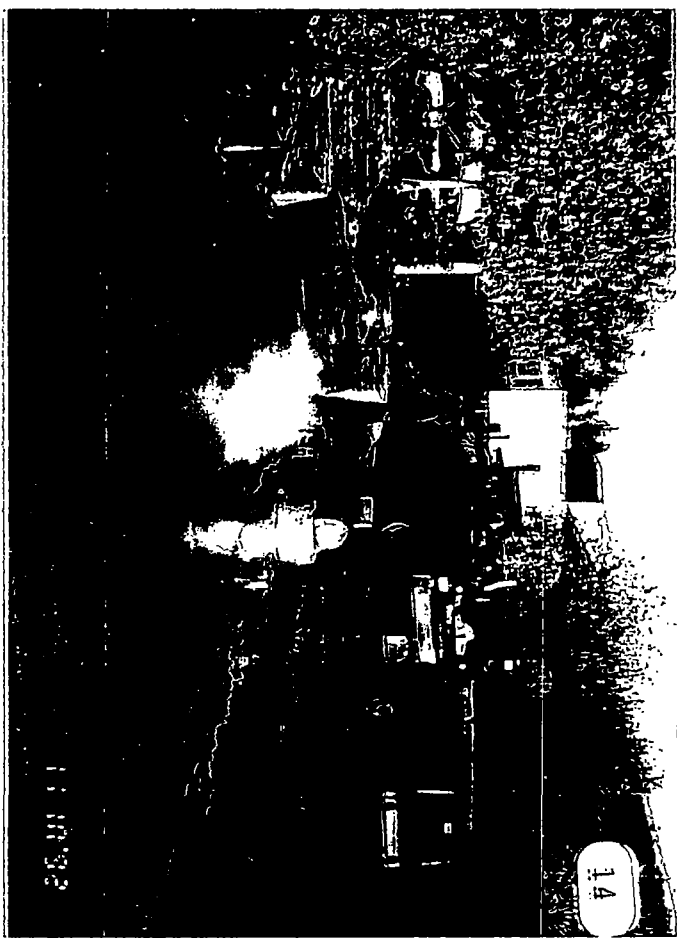
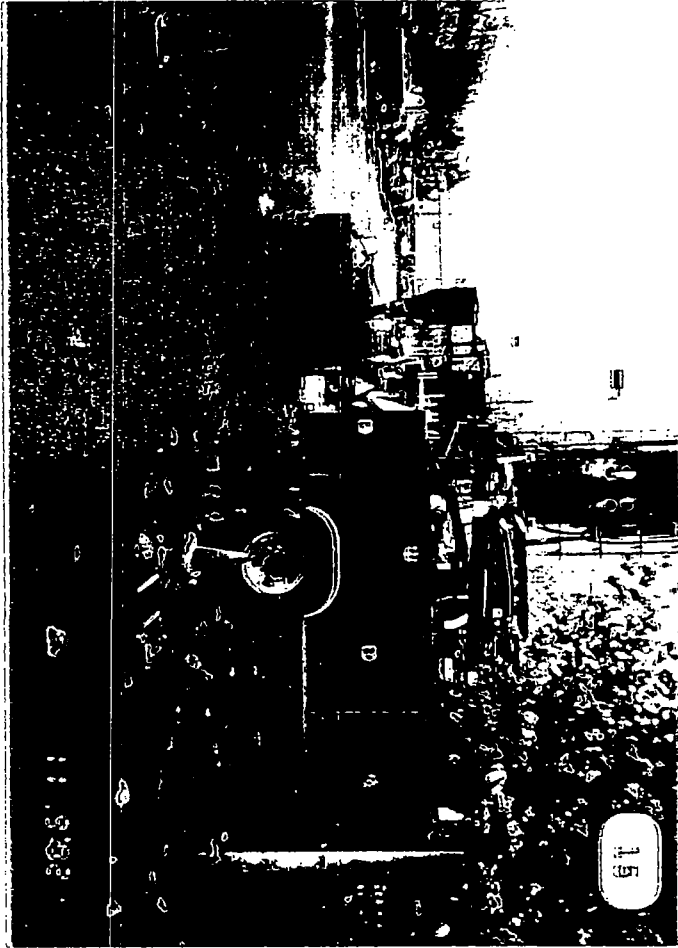
Site Name: Northwest Pipe and Casing

Photo No.	Date	Taken By	Description
1	10/26/92	D. Hartley	Looking northwest from outside gate on Mather Rd.
2	10/26/92	D. Hartley	As above.
3	10/31/92	D. Hartley	Looking down at utility clearance at MW-9 while rigging up.
4	11/03/92	D. Hartley	TAT field screening laboratory.
5	11/03/92	D. Hartley	Looking west from in front of ODOT.
6	11/05/92	D. Hartley	Field Chromatograph laboratory.
7	10/31/92	D. Hartley	Rig set up and ready to begin drilling at MW-9.
8	10/27/92	D. Hartley	Drilling at MW-8.
9	11/09/92	D. Hartley	Drilling at MW-10.
10	11/09/92	D. Hartley	Jacking out 8 inch working casing, at MW-9, note gravel in discharge.
11	11/18/92	D. Hartley	Backhoe at trench 3. Looking north.
12	11/18/92	D. Hartley	Looking down into trench 3.
13	11/09/92	D. Hartley	Looking east across MW-11 location.
14	11/10/92	D. Hartley	Cleaning up after constructing wellhead protection at MW-11.
15	11/10/92	D. Hartley	Looking west. Drilling at MW-12.
16	11/09/92	D. Hartley	Developing MW-11.
17	03/25/93	J. Kolb	Emptied drums, cuttings in foreground. Looking north.
18	03/25/93	J. Kolb	Looking west, draining storage tank.
19	03/26/93	J. Kolb	Loading empty drums to remove from site.
20	03/26/93	J. Kolb	Removing drums from NWPC.











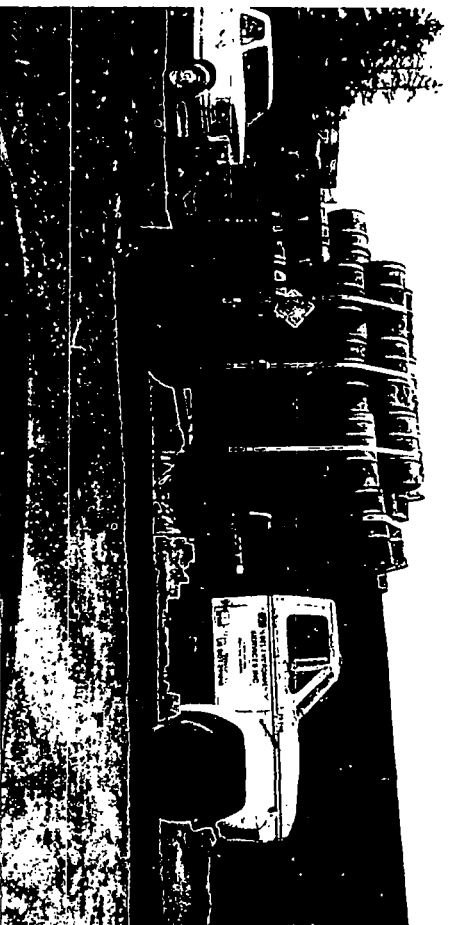
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APPENDIX B .

GEOLOGIC AND TRENCH LOGS

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
Boring Contractor: Staco Well Services
Boring Method: Downhole hammer
Logged By: Fowlow
Date Completed: 10-29-92

Job No.: EOR0201SCA
Location: Clackamas, Oregon
Surface Elevation: ~197 Feet
Casing Elevation: 200.59 Feet
Total Depth: 100 Feet
Groundwater: ~7 Feet

Boring No.: MW-8
Datum: ONG-1 (200)
Datum: ONG-1
Datum: BGS
Datum: BGS

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0—		Begin drilling: 0900		Conc. HNu Conc. GC-Soil Conc. GC-Water
—				
—				
—				
—	SM	From cuttings: <u>Silty sand</u> : Sand (50%), very fine grained, moderate brown, moist, with silt (40%), clay 10%).		
5—	<u>▽</u>			
—				
—				
—		Increasing gravel.		
—				
10—	GW	<u>Well graded gravel</u> : Gravel (100%), fine to coarse, moderate gray, subangular, dense, wet. Insufficient sample soil recovery for sampling.	MW-8-1 0935 10-28-92	6/10/22 0.6' rec 0 ppm HNu 0 ppb GC-S
—				
—				
—				
15—	GW	<u>Well graded gravel</u> : Gravel (90%), fine to coarse, moderate gray, subrounded, very dense, wet, with sand (10%).	MW-8-2 1005 10-28-92	5/30/37 0.8' rec 0 ppm HNu 0 ppb GC-S
—				
—				
—				

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing

Job No.: EOR0201SCA

Boring No.: MW-8

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
20— — — — —	GW	<u>Well graded gravel</u> : Gravel (90%), fine to coarse, moderate gray, subrounded, very dense, wet, with sand (10%).	MW-8-3 1030 10-28-92	15/50/70 1.0' rec 0 ppm HNu 0 ppb GC-S
25— — — — —	GW	<u>Well graded gravel with sand</u> : Gravel (85%), fine to coarse, moderate gray and moderate brown, subrounded, dense, wet, with sand (15%).	MW-8-4 1055 10-28-92	7/7/41 .0.5' rec 0 ppm HNu 0 ppb GC-S
30— — — — —	GW	<u>Well graded gravel with sand</u> : Gravel (85%), fine to coarse, moderate gray and moderate brown, subrounded, very dense, wet, with sand (15%).	MW-8-5 1125 10-28-92	8/26/64 0.8' rec 0 ppm HNu 0 ppb GC-S
35— — — — —	GW	<u>Well graded gravel with sand</u> : Gravel (85%), fine to coarse, moderate brown, subrounded, very dense, wet, with sand (15%).	MW-8-6 1200 10-28-92	11/100/R 0.7' rec 0 ppm HNu

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing

Job No.: EOR0201SCA

Boring No.: MW-8

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
40— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (60%), fine to coarse, moderate brown to moderate gray, subrounded to rounded, very dense, wet, with sand (35%), subangular, medium to coarse, gray to grayish red, and fines (5%).	MW-8-7 1315 10-28-92	17/100/R 0.8' rec 0 ppm HNu 0 ppb GC-S
45— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (70%), fine to coarse, moderate gray, subrounded, very dense, wet, with sand (30%), medium to coarse, moderate brown.	MW-8-8 1340 10-28-92	15/75/R 0.7' rec 0 ppm HNu 0 ppb GC-S
50— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (75%), fine to coarse, moderate gray, rounded to subrounded, very dense, wet, with sand (25%), medium to very coarse, reddish brown.	MW-8-9 1415 10-28-92	10/95/R 1.3' rec 0 ppm HNu 0 ppb GC-S
55— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (75%), fine to coarse, rounded, varied colors, dense, wet, with sand (25%), medium to very coarse, reddish brown.	MW-8-10 1445 10-28-92	5/12/27 1.0' rec 0 ppm HNu 0 ppb GC-S

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-8

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
60— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (70%), fine to coarse, varied colors, rounded, very dense, wet, with sand (30%), fine to very coarse, moderate brown, and trace fines.	MW-8-11 1545 10-28-92	12/70/R 0.9' rec 0 ppm HNu 0 ppb GC-S
65— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (60%), fine to coarse, varied colors, rounded, dense, wet, with sand (40%), medium to very coarse, moderate brown, and trace fines.	MW-8-12 1615 10-28-92	10/25/30 0.7' rec 0 ppm HNu
70— — — — —		Insufficient sample; cuttings indicate gravel as above.	1650 10-28-92	1/2/5 -- rec -- HNu
— — — — —	SM ----	From cuttings: 73 - 75' Very fine sand/silt layer ~ 2 feet thick; lower water transmissivity.	0830 10-29-92	
75— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (75%), fine to coarse, varied colors, rounded, medium dense, wet, with sand (25%), medium to very coarse, moderate brown, and trace fines. Additional sample same as above: From cuttings: 78 - 80' semilithified sandstone and shale, rounded to very angular cuttings, very low transmissivity.	0850 10-29-92 MW-8-14 0910 10-29-92	3/5/7 0.6' rec 0 ppm HNu 5/8/15 0.7' rec 0 ppm HNu 0 ppb GC-S

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-8

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
80— — — — —	GM	<u>Silty (clayey) gravel with sand:</u> Gravel (60%), mostly fine, various colors, rounded, very dense, moist to wet, with sand (25%), and fines (15%), green, cohesive. 80 - 85' drilled open borehole.	MW-8-15 0950 10-29-92	30/50/80(4) 0.8' rec 0 ppm HNu 0 ppb GC-S
85— — — — —	GW	<u>Well graded gravel:</u> Gravel (100%), fine to coarse, igneous rock fragments, black with some green phenocrysts, mineral decomposition along fracture planes, angular, dense, wet.	MW-8-16 1045 10-29-92	7/27/100 0.5' rec 0 ppm HNu 0 ppb GC-S
90— — — — —	GW	<u>Well graded gravel:</u> Gravel (90%), fine to coarse, igneous rock fragments, angular to rounded, dense, wet, with sand (10%).	MW-8-17 1145 10-29-92	5/7/30 0.7' rec 0 ppm HNu 0 ppb GC-S
95— — — — —	GM	<u>Silty (clayey) gravel with sand:</u> Gravel (60%), fine to coarse, mostly dark gray to black, subrounded to subangular fragments, very dense, wet, with sand (20%), and fines (20%), moderate brown, wet.	MW-8-18 1330 10-29-92	27/100/R 0.7' rec 0 ppm HNu

DRILLING AND SAMPLING LOGProject: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-8

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
100— — — — — 105— — — — — 110— — — — — 115— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (80%), fine to coarse, dark gray, subangular, dense, wet, with sand (20%). Total Depth: 100 feet below ground surface.	MW-8-19 1410 10-29-92	15/19/30 0.6' rec 0 ppm HNu

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
Boring Contractor: Staco Well Services
Boring Method: Downhole hammer
Logged By: Fowlow
Date Completed: 11-3-92

Job No.: EOR0201SCA
Location: Clackamas, Oregon
Surface Elevation: ~191 Feet
Casing Elevation: 189.92 Feet
Total Depth: 92 Feet
Groundwater: ~5 Feet

Boring No.: MW-9
Datum: ONG-1 (200)
Datum: ONG-1
Datum: BGS
Datum: BGS

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0— — — — —		Began drilling: 0830		Conc. HNU Conc. GC-Soil Conc. GC-Water
5— — — — — —	<u>∇</u>	From cuttings: Gravel with sand and silt.		
10— — — — — —	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (60%), fine to coarse, moderate brown, subangular to sub-rounded, very dense, wet, with sand (30%), and fines (10%).	MW-9-1 0845 11-2-92	5/27/45 0.7' rec 0 ppm HNU 0 ppb GC-soil 0 ppb GC-water
— — —	----	From cuttings: Increase silt ~ 13 - 14'.		
15— — — — — —	GW ----	<u>Well graded gravel:</u> Gravel (90%), fine to coarse, varied colors, subangular to rounded, medium dense, wet, with sand (5%), and fines (5%). Insufficient soil recovery for sampling.	MW-9-2 0905 11-2-92	5/8/10 0.5' rec 0 ppm HNU NA ppb GC-S C ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-9

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
20— — — — —	SM ----	<u>Silty sand</u> : Sand (60%), fine to coarse grained, light brown, subrounded, very dense, moist, with silt (20%), and gravel (10%). Decreasing water production.	MW-9-3 0930 11-2-92	10/27/55 0.9' rec 0 ppm HNu 0 ppb GC-S 0 ppb GC-W
25— — — — —	GW	<u>Well graded gravel</u> : Gravel (90%), fine to coarse, dark gray to grayish black, subangular, medium dense, wet, with sand (10%). Insufficient water and soil recovery for sampling.	MW-9-4 0950 11-2-92	4/6/19 0.5' rec 0 ppm HNu NA GC-S NA GC-W
30— — — — —	GW	<u>Well graded gravel with sand</u> : Gravel (75%), fine to coarse, dark gray, subangular to rounded, very dense, wet, with sand (25%), and trace of fines.	MW-9-5 1005 11-2-92	7/20/52 1.1' rec 0 ppm HNu 0 ppb GC-S 9 ppb GC-W
35— — — — —	GW	<u>Well graded gravel with sand</u> : Gravel (80%), fine to coarse, dark gray, subangular to rounded, dense, wet, with sand (15%), and fines (5%).	MW-9-6 1030 11-2-92	8/15/28 1.0' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-9

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
40— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (75%), fine to coarse, dark gray, subangular to subrounded, medium dense, wet, with sand (20%), and fines (15%).	MW-9-7 1050 11-2-92	5/10/15 0.7' rec 0 ppm OVA 0 ppb GC-S 2 ppb GC-W
45— — — — —	GW	<u>Well graded gravel:</u> Gravel (90%), fine to coarse, dark gray, subangular to rounded, medium dense, wet, with sand (10%), and trace fines. Insufficient soil recovery for sampling.	MW-9-8 1110 11-2-92	3/5/12 0.3' rec 0 ppm OVA NA ppb GC-S 5 ppb GC-W
50— — — — —	GW	<u>Well graded gravel:</u> Gravel (90%), fine to coarse, dark gray, subangular to rounded, medium dense, wet, with sand (10%) and trace fines. Insufficient soil recovery for sampling.	MW-9-9 1135 11-2-92	6/7/13 0.8' rec 1 ppm OVA NA ppb GC-S 0 ppb GC-W
55— — — — —	SW	<u>Well graded sand with gravel:</u> Sand (65%), medium to very coarse, moderate brown, subrounded to rounded, very dense, wet, with gravel (30%), and fines (5%).	MW-9-10 1210 11-2-92	7/70/R 1.0' rec 0.8 ppm OVA 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-9

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
60— — — — —	SM ----	<u>Silty sand with gravel:</u> Sand (60%), very fine to coarse, medium dark gray, subrounded, very dense, wet, with gravel (25%), and silt (15%). From cuttings: Wood fragments; semi-lithified sandy pellets.	MW-9-11 1320 11-2-92	14/60/75 1.0' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W
65— — — — —	SW- SM ----	<u>Well graded sand with silt and gravel:</u> Sand (75%), very fine to coarse, subrounded, dense, wet, with gravel (15%), and silt (10%). Possibly slough.	MW-9-12 1500 11-2-92	3/12/27 0.6' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W
70— — — — —	GW	<u>Well graded gravel:</u> Gravel (95%), fine to coarse, grayish black, subrounded to subangular, medium dense, wet with sand (5%) and trace fines.	MW-9-13 1530 11-2-92	3/6/12 0.4' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W
75— — — — —	GW	<u>Well graded gravel:</u> Gravel (95%), fine to coarse, medium gray to grayish black, subrounded to rounded, medium dense, wet, with sand (5%), and trace fines.	MW-9-14 1600 11-2-92	3/8/9 0.3' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-9

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
80— — — — —	GW	<u>Well graded gravel</u> : Gravel (90%), fine to coarse, medium gray to grayish black, subrounded to rounded, medium dense, wet, with sand (10%) and trace fines.	MW-9-15 1430 11-2-92	5/8/13 0.5' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W
85— — — — —	GW	<u>Well graded gravel</u> : Gravel (95%), fine to coarse, medium gray to grayish black, rounded, medium dense, wet, with sand (5%), and trace fines.	MW-9-16 0920 11-3-92	3/7/10 0.3' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W
— — — — —	SM			
90— — — — —	ML	From cuttings: Decrease water production @ 87' <u>Silty sand with trace clay</u> . <u>Sandy silt</u> : Silt (60%), medium gray, very stiff to hard, moist to dry, with sand (30%), and clay (10%). Total depth: 92 feet below ground surface.	MW-9-17 1010 11-3-92	4/7/15/60(8") 1.5' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W
95— — — — —		Boring MW-9 was terminated when a layer of fine sand, then silt, was encountered at ~87' bgs. Water flow through this formation was greatly reduced compared to formation above. Soil sampler was overdriven because ~8" of slough was detected by driller. The moisture level of the sample recovered also indicated a confining layer was encountered.		

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
Boring Contractor: Staco Well Services
Boring Method: Downhole Hammer
Logged By: Fowlow
Date Completed: 11-5-92

Job No.: EOR0201SCA
Location: Clackamas, Oregon
Surface Elevation: ~191 Feet
Casing Elevation: 189.92 Feet
Total Depth: 35 Feet
Groundwater: ~5 Feet

Boring No.: MW-10
Datum: ONG-1 (200)
Datum: ONG-1
Datum: BGS
Datum: BGS

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0— — — — —		MW-10 was installed within approximately 10 feet of MW-9. An insignificant geologic variation is assumed and therefore, no samples were collected.		Conc. HNU Conc. GC-Soil Conc. GC-Water
5— — — — — —	<u>▽</u>	From cuttings: Gravel with sand and silt.		
10— — — — —	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (60%), fine to coarse, moderate brown, subangular to sub-rounded, very dense, wet, with sand (30%), and fines (10%).		5/27/45 0.7' rec 0 ppm HNU 0 ppb GC-soil 0 ppb GC-water
— — — —	----	From cuttings: Increase silt ~ 13 - 14'.		
15— — — — — —	GW ----	<u>Well graded gravel:</u> Gravel (90%), fine to coarse, varied colors, subangular to rounded, medium dense, wet, with sand (5%), and fines (5%). Insufficient soil recovery for sampling.		5/8/10 0.5' rec 0 ppm HNU NA ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing

Job No.: EOR0201SCA

Boring No.: MW-10

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
20— — — — —	SM	<u>Silty sand</u> : Sand (60%), fine to coarse grained, light brown, subrounded, very dense, moist, with silt (20%), and gravel (10%). Decreasing water production.		10/27/55 0.9' rec 0 ppm HNu 0 ppb GC-S 0 ppb GC-W
25— — — — — —	GW	<u>Well graded gravel</u> : Gravel (90%), fine to coarse, dark gray to grayish black, subangular, medium dense, wet, with sand (10%). Insufficient water and soil recovery for sampling.		4/6/19 0.5' rec 0 ppm HNu NA GC-S NA GC-W
30— — — — — —	GW	<u>Well graded gravel with sand</u> : Gravel (75%), fine to coarse, dark gray, subangular to rounded, very dense, wet, with sand (25%), and trace of fines.		7/20/52 1.1' rec 0 ppm HNu 0 ppb GC-S 9 ppb GC-W
35— — — — — —	GW	<u>Well graded gravel with sand</u> : Gravel (80%), fine to coarse, dark gray, subangular to rounded, dense, wet, with sand (15%), and fines (5%). Total depth: 35 feet below ground surface.		8/15/28 1.0' rec 0 ppm OVA 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
Boring Contractor: Staco
Boring Method: Downhole Hammer
Logged By: Fowlow
Date Completed: 11-7-92

Job No.: EOR0201SCA
Location: Clackamas, Oregon
Surface Elevation: ~192 Feet
Casing Elevation: 191.26 Feet
Total Depth: 76 Feet
Groundwater: ~5 Feet

Boring No.: MW-11

Datum: ONG-1 (200)

Datum: ONG-1

Datum: BGS

Datum: BGS

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0— — — — —		Began drilling: 1500		Conc. HNu Conc. GC-Soil Conc. GC-Water
5— — — — —	<u>▽</u>	From cuttings: Fine to coarse, subrounded, moderate brown, well graded gravel with sand and silt.		
10— — — — —	GW- GM	<u>Well graded gravel with silt:</u> Gravel (80%), fine to coarse, subrounded, moderate brown, very dense, wet, with sand (10%), and fines (10%).	MW-11-1 1520 11-6-92	15/31/41(R) 0.5' rec 0 ppb GC-S 0 ppb GC-W
15— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (80%), fine to coarse, subrounded to subangular, moderate brown to medium gray, very dense, wet, with sand (15%), and fines (5%). Decrease water production at 19' bgs, increase sand and fines.	MW-11-2 1600 11-6-92	26/75(R)/- 0.5' rec 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-11

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
20— — — — —	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (70%), fine to coarse, subangular to subrounded, medium dark gray to dark gray, very dense, wet to moist, with sand (20%), and fines (10%).	MW-11-3 1635 11-6-92	25/75(RI)- 0.7' rec 0 ppb GC-S 0 ppb GC-W
25— — — — —	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (70%), fine to coarse, angular to subrounded, medium dark gray to dark gray, very dense, wet, with sand (20%), and fines (10%).	MW-11-4 0800 11-7-92	28/80(5I)- 0.7' rec 0 ppb GC-S C ppb GC-W
30— — — — —	GW -----	<u>Well graded gravel:</u> Gravel (95%), fine to coarse, angular to subrounded, dark gray, medium dense, wet, with sand (5%).	MW-11-5 0835 11-7-92	5/5/9 0.4' rec NA ppb GC-S 0 ppb GC-W
35— — — — —	GW- GM -----	<u>Well graded gravel with sand:</u> Gravel (75%), fine to coarse, angular to subrounded, dark gray, very dense, wet, with sand (20%), and fines (5%).	MW-11-6 0900 11-7-92	9/22/70 0.8' rec 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing

Job No.: EOR0201SCA

Boring No.: MW-11

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
40— — — — —	GW	<u>Well graded gravel</u> : Gravel (95%), coarse to fine, rounded to angular, various colors, medium dense, wet, with sand (<5%).	MW-11-7 0930 11-7-92	5/5/10 0.7' rec NA ppb GC-S 0 ppb GC-W
45— — — — —	GW	<u>Well graded gravel</u> : Gravel (95%), coarse to fine, rounded to angular (broken), dark gray with various colors, medium dense, wet with sand (<5%).	MW-11-9 1000 11-7-92	6/7/11 0.7' rec NA ppb GC-S 0 ppb GC-W
50— — — — —	GW	<u>Well graded gravel</u> : As above.	MW-11-9 1030 11-7-92	5/8/15 0.5' rec NA ppb GC-S 0 ppb GC-W
55— — — — —	GW	<u>Well graded gravel</u> : Gravel (90%), coarse to fine, rounded to angular (broken), various colors, very dense, wet with sand (10%).	MW-11-10 1055 11-7-92	5/15/70(5) 0.8' rec NA ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-11

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
60— — — — —	GW	<u>Well graded gravel</u> : Gravel (90%), coarse to fine, rounded to angular (broken), various colors, medium dense, wet, with sand (10%).	MW-11-11 1140 11-7-92	8/12/16 0.7' rec NA ppb GC-S 0 ppb GC-W
65— — — — —	GW	<u>Well graded gravel</u> : As above.	MW-11-12 1300 11-7-92	8/11/16 0.7' rec NA ppb GC-S 0 ppb GC-W
— — — — —	----	Increasing sand/silt in cuttings; decreasing water production.		
70— — — — —	SM	<u>Silty sand with clay</u> : Sand (60%), very fine to medium, dark gray, medium dense, moist, with silt (25%), and clay (15%).	MW-11-13 1400 11-7-92	7/7/21 0.8' rec 0 ppb GC-S 0 ppb GC-W
— — — — —	----			
75— — — — —	ML	<u>Clayey silt with sand</u> : Silt (50%), medium dark gray, hard, moist to dry, with clay (30%), and sand (20%). Total depth: 76 feet below ground surface.	MW-11-14 1450 11-7-92	14/35/56 1.2' rec 0 ppb GC-S NA ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
Boring Contractor: Staco
Boring Method: Downhole Hammer
Logged By: Fowlow
Date Completed: 11-9-92

Job No.: EOR0201SCA
Location: Clackamas, Oregon
Surface Elevation: ~192 Feet
Casing Elevation: 191.55 Feet
Total Depth: 40 Feet
Groundwater: ~5 Feet

Boring No.: MW-12
Datum: ONG-1 (200)
Datum: ONG-1
Datum: BGS
Datum: BGS

Depth (feet)	Symbol	Lithological Description	Sample Number <small>(date/time)</small>	Remarks Total blows/ Recovery
0— - - - -		MW-12 was installed within approximately 10 feet of MW-11. An insignificant geologic variation is assumed and therefore, no samples were collected.		Conc. HNu · Conc. GC-Soil Conc. GC-Water
5— - - - -	<u>∇</u>	From cuttings: Fine to coarse, subrounded, moderate brown, well graded gravel with sand and silt.		
10— - - - -	GW-GM	<u>Well graded gravel with silt:</u> Gravel (80%), fine to coarse, subrounded, moderate brown, very dense, wet, with sand (10%), and fines (10%).		15/31/41(R) 0.5' rec 0 ppb GC-S 0 ppb GC-W
15— - - - -	GW	<u>Well graded gravel with sand:</u> Gravel (80%), fine to coarse, subrounded to subangular, moderate brown to medium gray, very dense, wet, with sand (15%), and fines (5%). Decreased water production at 19' bgs, increase sand and fines.		26/75(R)/- 0.5' rec 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing

Job No.: EOR0201SCA

Boring No.: MW-12

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
20— — — — —	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (70%), fine to coarse, subangular to subrounded, medium dark gray to dark gray, very dense, wet to moist, with sand (20%), and fines (10%).		25/75(R)/- 0.7' rec 0 ppb GC-S 0 ppb GC-W
25— — — — —	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (70%), fine to coarse, angular to subrounded, medium dark gray to dark gray, very dense, wet, with sand (20%), and fines (10%).		28/80(5)/- 0.7' rec 0 ppb GC-S 0 ppb GC-W
30— — — — —	GW ----	<u>Well graded gravel:</u> Gravel (95%), fine to coarse, angular to subrounded, dark gray, medium dense, wet, with sand (5%).		5/5/9 0.4' rec NA ppb GC-S 0 ppb GC-W
35— — — — —	GW- GM -----	<u>Well graded gravel with sand:</u> Gravel (75%), fine to coarse, angular to subrounded, dark gray, very dense, wet, with sand (20%), and fines (5%).		9/22/70 0.8' rec 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOGProject: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: MW-12

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
40— — — — — 45— — — — — 50— — — — — 55— — — — —	GW	<u>Well graded gravel</u> : Gravel (95%), coarse to fine, rounded to angular, various colors, medium dense, wet, with sand (<5%). Total depth: 40 feet below ground surface.		5/5/10 0.7' rec NA ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
Boring Contractor: Staco Well Services
Boring Method: Downhole Hammer
Logged By: Fowlow
Date Completed: 11-13-92

Job No.: EOR0201SCA
Location: Clackamas, Oregon
Surface Elevation: ~197 Feet
Casing Elevation: 195.97 Feet
Total Depth: 112 Feet
Groundwater: ~5 Feet

Boring No.: DOT 5
Datum: ONG-1 (200)
Datum: ONG-1
Datum: BGS
Datum: BGS

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0—		Begin drilling: 1110		Conc. GC-Soil Conc. GC-Water
—				
—				
—				
—	<u>∇</u>	From cuttings: Silty, sandy soil 0 - 5' bgs; sandy gravel 5' - 10' bgs.		
5—				
—				
—				
—				
—				
10—	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (60%), fine to coarse, subangular to subrounded, grayish brown, very dense, wet, with sand (30%), and silt (10%).	DOT-5-1 1130 11-11-92	9/70(5)/- 0.5' rec 0 ppb GC-S 0 ppb GC-W
—				
—				
—				
15—	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (60%), fine to coarse, subrounded, varied colors, very dense, wet, with sand (30%), and silt (10%).	DOT-5-2 1220 11-11-92	14/31/70(5) 0.6' rec 0 ppb GC-S 2.5 ppb GC-W
—				
—				
—				
—				

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: DOT-5

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
20— — — — —	GM	<u>Silty gravel with sand</u> : Gravel (50%), fine to coarse, subangular to subrounded, grayish brown to dark gray, very dense, wet, with sand (30%), and silt (20%).	DOT-5-3 1245 11-11-92	70(5)/-/ 0.5' rec 0 ppb GC-S 0 ppb GC-W
25— — — — —	GM	<u>Silty gravel with sand</u> : Gravel (45%), fine to coarse, subangular to subrounded, grayish brown, very dense, wet, with sand (40%), and fines (15%).	DOT-5-4 1340 11-11-92	18/28/32 1.0' rec 0 ppb GC-S 0 ppb GC-W
30— — — — —	GW- GM	<u>Well graded gravel with silt and sand</u> : Gravel (70%), fine to coarse, subrounded, grayish brown, very dense, wet, with sand (20%), and fines (10%).	DOT-5-5 1410 11-11-92	13/26/70(5) 0.7' rec 0 ppb GC-S NA ppb GC-W
35— — — — —	GW- GM	<u>Well graded gravel with silt and sand</u> : Gravel (60%), fine to coarse, subrounded, grayish brown, very dense, wet, with sand (30%), and fines (10%).	DOT-5-6 1445 11-11-92	30/70(4)/- 0.5' rec <1 ppb GC-S <1 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: DOT-5

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
40— — — — —	GW- GM	<u>Well graded gravel with silt and sand:</u> Gravel (70%), fine to coarse, subrounded, grayish brown, very dense, wet, with sand (20%), and fines (10%).	DOT-5-7 1515 11-11-92	13/70(5)/- 0.5' rec 0 ppb GC-S 0 ppb GC-W
45— — — — —	GW- GM	<u>Well graded gravel with silt and sand:</u> As above.	DOT-5-8 1645 11-11-92	10/70(5)/- 0.5' rec 0 ppb GC-S 2 ppb GC-W
50— — — — —	SM	<u>Silty sand with gravel:</u> Sand (65%), fine to very coarse, moderate brown, medium dense, wet, with gravel (20%), and fines (15%).	DOT-5-9 0815 11-12-92	7/5/13 0.6' rec 0 ppb GC-S 0 ppb GC-W
55— — — — —	SM	<u>Silty sand with gravel:</u> As above.	DOT-5-10 0910 11-12-92	17/70(1)/- 0.8' rec 0 ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: DOT-5

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
60—		Gravel and ~0.3' of cemented medium to coarse sand.		
—	ML	<u>Silt with sand</u> : Silt (50%), dark yellowish orange, hard, moist to dry, with sand (25%), very fine, and clay (25%). Decreased transmissivity.	DOT-5-11 0950 12-12-92	8/60/70(1) 1.1' rec 0 ppb GC-S 0 ppb GC-W
—	GW- GM	Silt and cemented sand ~60.5' to 61.5' bgs. Gravel (wet) with sand and fines resume: ~61.5 bgs.		
65—	---- SM	<u>Silty sand with gravel</u> : Sand (60%), well graded but mostly coarse, dark gray, subrounded, very dense, wet to moist, with fines (25%), and gravel (15%).	DOT-5-12 1030 11-12-92	11/27/40 1.0' rec 0 ppb GC-S 0 ppb GC-W
—	GW- GM	Gravel with sand and fines.		
70—	---- SM	<u>Silty sand with gravel</u> : Sand (70%), well graded but mostly coarse, dark gray, very dense, wet, with fines (15%), and gravel (15%). Increasing gravel in cuttings.	DOT-5-13 1110 11-12-92	70(3)/-/ 0.9' rec 0 ppb GC-S 0 ppb GC-W
75—	SM	<u>Silty sand with gravel</u> : Sand (50%), very fine to medium, grayish black, very dense, moist, with fines (25%), and gravel (25%).	DOT-5-14 1320 11-12-92	18/48/70(3) 1.0' rec 0 ppb GC-S 0 ppb GC-W
—	----	Increasing gravel in cuttings.		

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: DOT-5

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
80— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (65%), fine to coarse, subrounded to rounded, grayish black, very dense, wet, with sand (30%), and fines (5%).	DOT-5-15 1400 11-12-92	23/70(5)/- 1.1' rec 0 ppb GC-S 0 ppb GC-W
85— — — — —	GW	<u>Well graded gravel with sand:</u> As above.	DOT-5-16 1450 11-12-92	6/18/70 1.3' rec 0 ppb GC-S 0 ppb CC-W
90— — — — —	GW	<u>Well graded gravel with sand:</u> Gravel (80%), fine to coarse, subrounded, grayish black, very dense, wet, with sand (20%), and trace fines.	DOT-5-17 1520 11-12-92	5/18/40 1.0' rec NA ppb GC-S 0 ppb GC-W
95— — — — —	GW	<u>Well graded gravel with sand:</u> As above.	DOT-5-18 1615 11-12-92	3/3/80 0.8' rec NA ppb GC-S 0 ppb GC-W

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and CasingJob No.: EOR0201SCABoring No.: DOT-5

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
100— — — — — 105— — — — — 110— — — — — — 115— — — — — —	GM ----- CL CL CL	<p>From cuttings: Well graded gravel with sand.</p> <p>From cuttings @ 103': Silty clay with sand and gravel.</p> <p>Driving 10' casing - sampling not possible at 105'.</p> <p>From cuttings to 110' bgs: Silty clay with progressively decreasing gravel and sand.</p> <p><u>Lean clay</u>: Clay (60%), grayish black, hard, with silt (30%), and sand (10%).</p> <p>Total depth: 112 feet below ground surface.</p>	<p>DOT-5-19 1000 11-13-92</p>	<p>8/18/36 1.5' rec 0 ppb GC-S 0 ppb GC-W</p>

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing

Job No.: EOR0201SCA

Boring No.: DOT-6

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
20— — — — — 25— — — — — 30— — — — — 35— — — — —	GM	<p><u>Silty gravel with sand</u>: Gravel (50%), fine to coarse, subangular to subrounded, grayish brown to dark gray, very dense, wet, with sand (30%), and silt (20%).</p> <p>Total depth: 20 feet below ground surface.</p>		<p>70(5)/-/- 0.5' rec 0 ppb GC-S 0 ppb GC-W</p>

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
 Boring Contractor: Staco Well Services
 Boring Method: Backhoe
 Logged By: Fowlow
 Date Completed: 11-18-92

Job No.: EOR0201SCA
 Location: Clackamas, Oregon
 Surface Elevation: NA
 Casing Elevation: NA
 Total Depth: 6 Feet
 Groundwater: NA

Boring No.: T-1
 Datum: NA
 Datum: NA
 Datum: BGS
 Datum: NA

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0—	SM	Silty sand with gravel, brown, dry, roots in top foot.		
—		Moisture seeps.		
—	OL	Clayey silt, black, high organic content.		
—				
—				
5—	CL	Gravelly clay, gray, lean.		
—				
—				
—				
10—				
—				
—				
—				
15—				
—				
—				
—				
—				

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
Boring Contractor: Staco Well Services
Boring Method: Backhoe
Logged By: Fowlow
Date Completed: 11-18-92

Job No.: EOR0201SCA
Location: Clackamas, Oregon
Surface Elevation: NA
Casing Elevation: NA
Total Depth: 8.5 Feet
Groundwater: NA

Boring No.: T-2

Datum: NA

Datum: NA

Datum: BGS

Datum: NA

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0—				
—				
—	SW	Well-graded sand with gravel, dry, brown.		
—				
—	—	Moisture seeps: oily, odorous. Buried material: cloth, etc.		
—				
5—	CH	Fat clay with silt, black to gray, organic, plastic.		
—				
—	—			
—				
—	GM	Silty gravel with sand, gray, moist.		
—				
10—		Total depth: 8.5 feet below ground surface.		
—				
—				
—				
—				
15—				
—				
—				
—				
—				

DRILLING AND SAMPLING LOG

Boring No.: T-3

100

Datum: NA

Datum: NA

Datum: BGS

Datum: NA

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0—				
-	SW	Well-graded sand with gravel, dry, brown.		
-				
-	MH	Elastic silt with sand and clay, moist, plastic.		
-				
-	GW-SW	Well graded gravel and sand, moist, brown.		
5—		Moisture seeps: no odor or sheen.	No sample collected.	
-	GW-SW	Well graded gravel and sand, moist to wet, gray.		
-				
-				
-				
-				
10—				
-				
-				
-				
-				
-				
15—				
-				
-				
-				
-				

DRILLING AND SAMPLING LOG

Project: Northwest Pipe and Casing
 Boring Contractor: Staco Well Services
 Boring Method: Backhoe
 Logged By: Fowlow
 Date Completed: 11-18-92

Job No.: EOR0201SCA
 Location: Clackamas, Oregon
 Surface Elevation: NA
 Casing Elevation: NA
 Total Depth: 8 Feet
 Groundwater: NA

Boring No.: T-4
 Datum: NA
 Datum: NA
 Datum: BGS
 Datum: NA

Depth (feet)	Symbol	Lithological Description	Sample Number (date/time)	Remarks Total blows/ Recovery
0—				
—	CL	Lean clay with silt and trace gravel, gray to yellowish gray, moist.		
—				
—				
—	ML	Silt with sand and trace clay, unstratified, brown.		
5—		Large (4 ft. diameter) buried metallic object (crushed drum?).		
—				
—		Moisture seep: hydrocarbon sheen and odor.		
—	SM	Silty sand with organic clays, brown to black. Large amount of buried debris (plastic, rubber, metal, rags, coal tar, and slag, etc.).		
—				
10—		Total depth: 8 feet below ground surface.		
—				
—				
—				
—				
15—				
—				
—				
—				
—				

Groundwater
sample collected
at moisture seep.

Start Card #

1) OWNER/PROJECT: WELL NO. MW-8
NAME ENVIRONMENTAL PROTECTION AGENCY
ADDRESS 1200 6TH AVE
CITY SEATTLE STATE WA ZIP

(2) TYPE OF WORK:

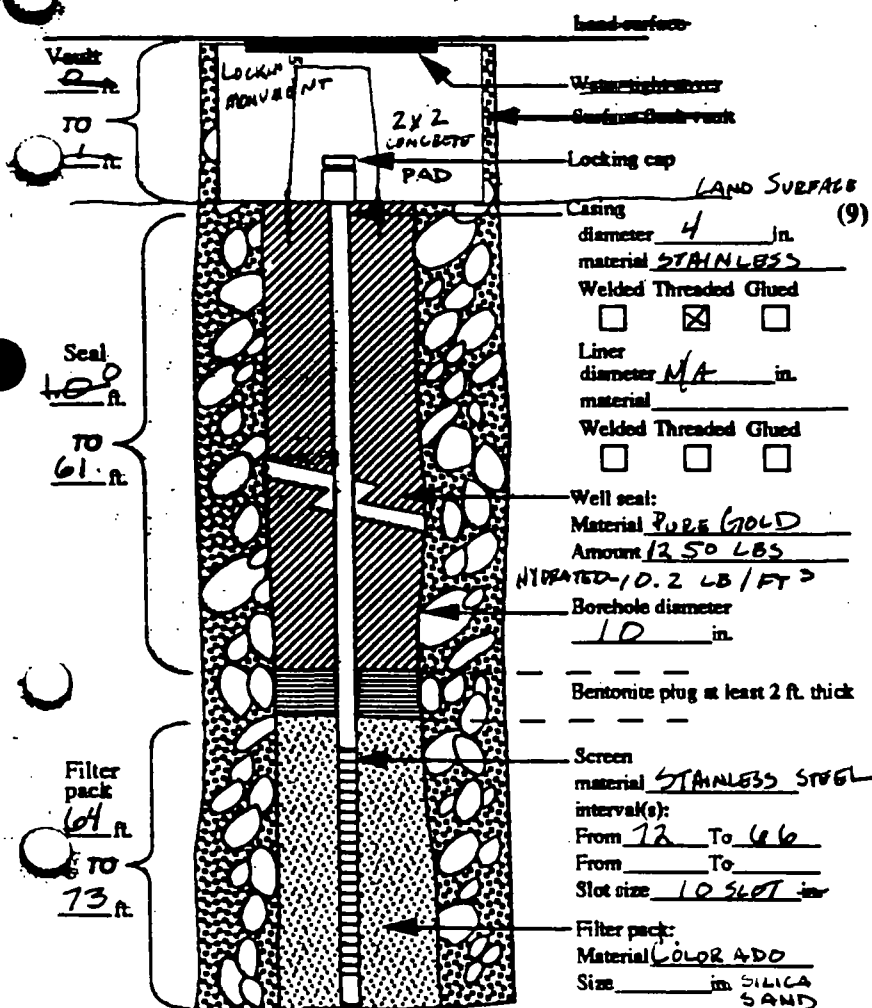
☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

(3). DRILLING METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Hollow Stem Auger ☐ Other _____

(4) BORE HOLE CONSTRUCTION

Special Standards: Yes ☐ No ☒ Depth of completed well 72 ft.



(6) LOCATION OF WELL By legal description

Well Location: County CLACKAMAS
Township 2 (N or S) Range 2 (E or W) Section 9
1. SW 1/4 of NE 1/4 of above section.
2. Street address of well location SW CORNER OF
MATHER ROAD AND INDUSTRIAL WAY
3. Tax lot number of well location -
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

8.04 ft. below land surface. Date 11/17/92
Artesian Pressure — lb/sq. in. Date —

(8) WATER BEARING ZONES: —

Depth at which water was first found 7

From	To	Est. Flow Rate	SWL
7'	100'	15 GPM	8'

(9) WELL LOG:

Ground elevation _____

[illegible]

Date started 10/27/92 Completed 10/30/92

(5) WELL TEST:

☐ Pump ☐ Bailor ☒ Air ☐ Flowing Artesian

Permeability - Yield 15 GPM

Conductivity 400 μ S PH 7.65

Temperature of water 13.5 °C Depth artesian flow found - ft.

Was water analysis done? ☒ Yes ☐ No

By whom? COMMERCIAL LAB FOR EPA

Depth of strata to be analyzed. From 666 ft. to 72 ft.

Remarks:

Name of supervising Geologist/Engineer D.A. HARTLEY

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed _____ MWC Number _____
Date _____

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment of work performed on this well during the construction dates reported above. A work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signature _____ MWC Number _____
Date: _____

STATE OF OREGON
MONITORING WELL REPORT
 (as required by ORS 537.765 & OAR 690-240-035)

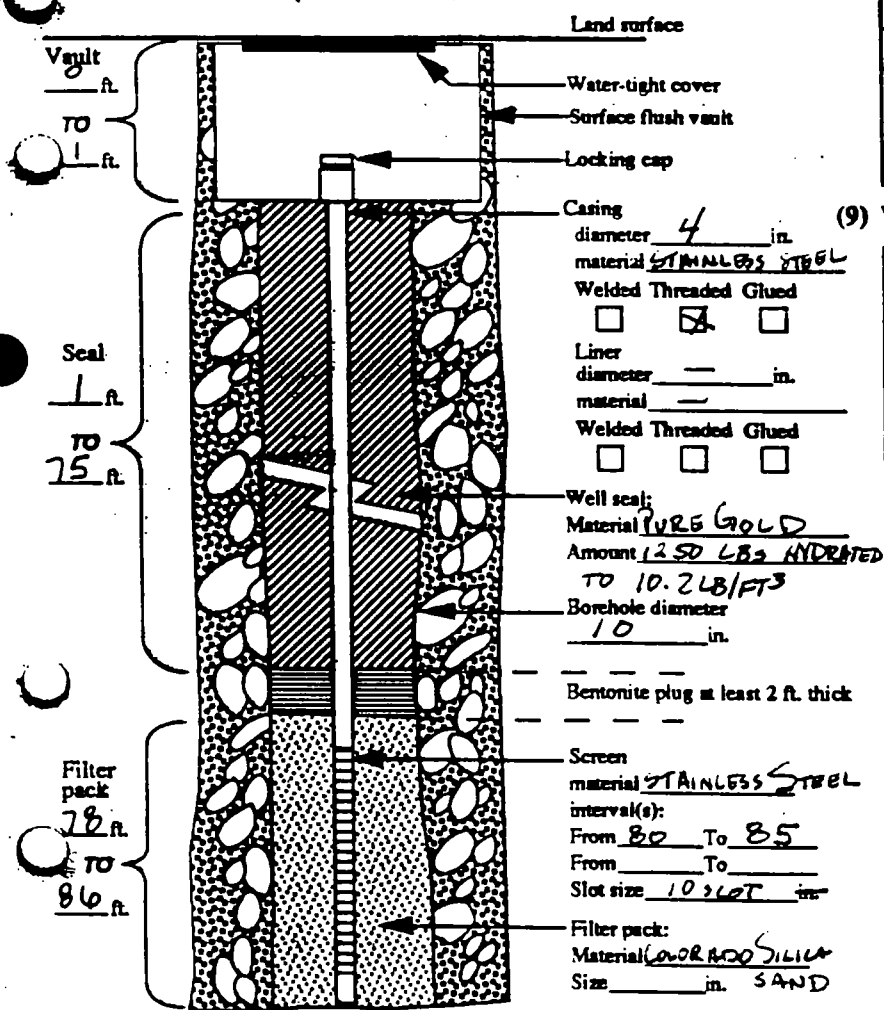
Start Card # _____

(1) OWNER/PROJECT: WELL NO. MW-9
 Name ENVIRONMENTAL PROTECTION AGENCY
 Address 1800 6TH AVE
 City SEATTLE State WA Zip _____

(2) TYPE OF WORK:
☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

(3) DRILLING METHOD
☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Hollow Stem Auger ☐ Other _____

(4) BORE HOLE CONSTRUCTION
 Special Standards Yes ☐ No ☒ Depth of completed well 86 ft.



(6) LOCATION OF WELL By legal description
 Well Location: County CLATSOP
 Township 2 (N or S) Range 2 (E or W) Section 4
 1. SW 1/4 of SE 1/4 of above section
 2. Street address of well location 9200 LAWNFIELD
 3. Tax lot number of well location _____
 4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:
2.89 ft. below land surface. Date 11-19-92
 Artesian Pressure _____ lb/sq. in. Date _____

(8) WATER BEARING ZONES: 5'
 Depth at which water was first found 5'

From	To	Est. Flow Rate	SWL
<u>5'</u>	<u>90'</u>	<u>50 GPM</u>	<u>2.89'</u>

(9) WELL LOG: Ground elevation _____

Material	From	To	SWL
<u>WELL GRADED GVL w/ SILT + SAND</u>	<u>0</u>	<u>15</u>	<u>2.89</u>
<u>WELL GRADED GRAVEL</u>	<u>15</u>	<u>20</u>	
<u>SILTY SAND</u>	<u>20</u>	<u>25</u>	
<u>WELL GRADED GRAVEL</u>	<u>25</u>	<u>30</u>	
<u>" " " w/ SAND</u>	<u>30</u>	<u>45</u>	
<u>WELL GRADED GRAVEL</u>	<u>45</u>	<u>55</u>	
<u>WELL GRADED SAND w/ GVL</u>	<u>55</u>	<u>60</u>	
<u>SILTY SAND w/ GVL</u>	<u>60</u>	<u>65</u>	
<u>SAND w/ SILT and GVL</u>	<u>65</u>	<u>70</u>	
<u>WELL GRADED GVL</u>	<u>70</u>	<u>90</u>	
<u>SANDY SILT - MED. GREY</u>	<u>90</u>	<u>92</u>	
<u>TOTAL DEPTH - 92 FEET</u>			

Date started 10/31/92 Completed 11/04/92

(5) WELL TEST:
☐ Pump ☐ Bailor ☒ Air ☐ Flowing Artesian
 Permeability _____ Yield 50 GPM
 Conductivity 350 uS PH 7.87
 Temperature of water 13.9 °C Depth artesian flow found _____ ft.
 Was water analysis done? ☒ Yes ☐ No
 By whom? COMMERCIAL LAB FOR EPA
 Depth of strata to be analyzed From 78 ft. to 86 ft.
 Remarks: _____

(unbonded) Monitor Well Constructor Certification:
 I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.
 Signed _____ MWC Number _____
 Date _____

(bonded) Monitor Well Constructor Certification:
 I accept responsibility for the construction, alteration, or abandonment of work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.
 Signed _____ MWC Number _____
 Date _____

Name of supervising Geologist/Engineer D.A. HARTLEY

Start Card #

(6) LOCATION OF WELL By legal description

Well Location: County CLACKAMAS

Township 2 (N or S) Range 2 (E or W) Section 4

1. SW 1/4 of SE 1/4 of above section.

2. Street address of well location 9200 LAWNFIELD

3. Tax lot number of well location

4. ATTACH MAP WITH LOCATION IDENTIFIED.

(2) TYPE OF WORK:

☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

(3). DRILLING METHOD

☒ Rotary Air ☐ Rotary Mod ☐ Cable
☐ Hollow Stem Auger ☐ Other _____

(7) STATIC WATER LEVEL:

1.79 ft. below land surface. Date 11-19-92
Artesian Pressure _____ lb/sq. in. Date _____

(4) BORE HOLE CONSTRUCTION

(8) WATER BEARING ZONES:

Depth at which water was first found 5

From	To	Est. Flow Rate	SWL
5	35		2'

(9) WELL LOG:

Ground elevation

[illegible]

Date started 04 NOV 92 Completed 06 NOV 92

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed _____
(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment of work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signature _____ MWC Number _____
Date _____

(5) WELL TEST:

☐ Pump ☐ Bailer ☒ Air ☐ Flowing ArtesianPermeability — Yield 2 GPM

Conductivity 600 μ S PH 8.00

Temperature of water 15 °C Depth artesian flow found — ft.

Was water analysis done? ☒ Yes ☐ No

By whom? COMMERCIAL LAB FOR EPA

Depth of strata to be analyzed: From 27 ft. to 35 ft.

Remarks: _____

Name of supervising Contractor D. A. HARTLEY

Start Card #

(6) LOCATION OF WELL By legal description

Well Location: County CLACKAMAS

Township 2 N of S Range 2 E of W Section 4

1. SE 1/4 of SE 1/4 of above section.

2. Street address of well location LAWNFIELD
NW DEVELOPMENT CO. PARKING LOT

3. Tax lot number of well location

4. ATTACH MAP WITH LOCATION IDENTIFIED.

(2) TYPE OF WORK:

<input checked="" type="checkbox"/> New construction	<input type="checkbox"/> Repair	<input type="checkbox"/> Recondition
<input type="checkbox"/> Conversion	<input type="checkbox"/> Deepening	<input type="checkbox"/> Abandonment

(3) DRILLING METHOD

☒ Rotary Air ☐ Rotary Mod ☐ Cable
☐ Hollow Stem Auger ☐ Other _____

(7) STATIC WATER LEVEL:

3.4 ft. below land surface.

Date 11-19-92

Arterial Pressure — lb/sq. in.

Date: _____

(4) BORE HOLE CONSTRUCTION

(8) WATER BEARING ZONES:

Depth at which water was first found

From	To	Est. Flow Rate	SWL
S'	73	50 GPM	3-5'

(9) WELL LOG:

Ground elevation

[illegible]

Date started 06 NOV 92 Completed 08 NOV 92

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed _____ MWC Number _____
Date _____

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. A work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Stated _____ **MWC Number** _____
Date _____

(5) WELL TEST:

☐ Pump ☐ Bailer ☒ Air ☐ Flowing ArtesianPermeability — Yield 50 GPM

Conductivity 250 μ S PH 7.70

Temperature of water 14.6 °C Depth artesian flow found —

Was water analysis done? ☒ Yes ☐ No

By whom? COMMERCIAL LAB FOR EPA

Depth of stress to be analyzed: From 58 ft to 64.5 ft

Remarks

Name of supervising Geologist/Engineer D. A. HARTLEY

Start Card #

Signed _____ MWC Number _____
Date _____

Name of supervising Geologist/Engineer: D. A. HARTLEY

**STATE OF OREGON
MONITORING WELL REPORT**
(as required by ORS 537.765 & OAR 690-240-095)

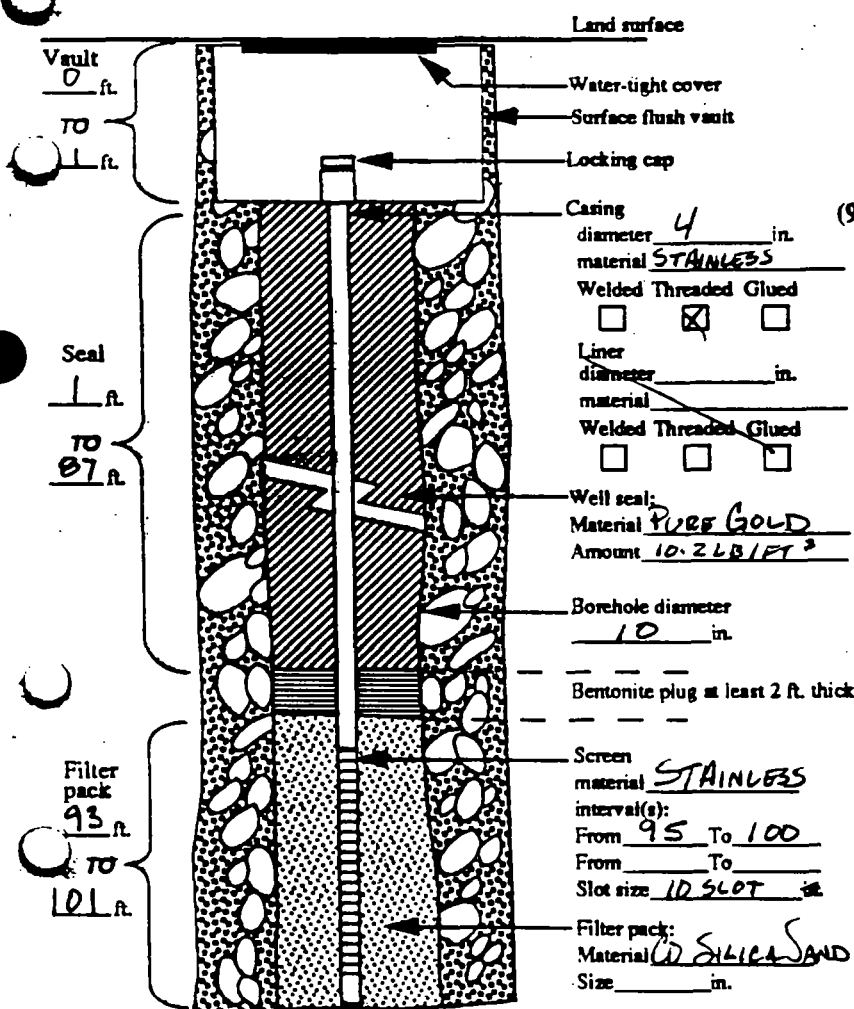
Start Card # _____

(1) OWNER/PROJECT: WELL NO. DOT-5
Name OREGON DEPT. OF TRANSPORTATION
Address 9200 LAWN FIELD
City CLACKAMAS State OR Zip _____

(2) TYPE OF WORK:
☒ New construction ☐ Repair ☐ Recondition
☐ Conversion ☐ Deepening ☐ Abandonment

(3) DRILLING METHOD
☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Hollow Stem Auger ☐ Other _____

(4) BORE HOLE CONSTRUCTION
Special Standards Yes ☐ No ☒ Depth of completed well 101 ft.



(6) LOCATION OF WELL By legal description
Well Location: County CLACKAMAS
Township 2 N or S Range 2 (E or W) Section 9
1. NW 1/4 of NE 1/4 of above section.
2. Street address of well location SAME AS OWNER
3. Tax lot number of well location _____
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:
6.3 ft. below land surface. Date 11-19-92
Artesian Pressure _____ lb/sq. in. Date _____

(8) WATER BEARING ZONES:
Depth at which water was first found 5'

From	To	Est. Flow Rate	SWL
5'	110	20 GPM	6'

(9) WELL LOG: Ground elevation _____

Material	From	To	SW
SILTY SANDY SOIL	0	5	
SANDY GRAVEL	5	10	✓6
WELL GRADED GUL W/ SAND	10	20	
SILTY GRAVEL W/ SAND	20	30	
WELL GRADED GUL W/ SAND	30	50	
SILTY SAND W/ GRAVEL	50	61	
SILT W/ SAND	61	62	
SILTY SAND W/ GRAVEL	62	80	
WELL GRADED GUL W/ SAND	80	103	
SILTY CLAY W/ SAND + GUL	103	110	
LEAN CLAY	110	112	
TOTAL DEPTH - 112 FEET			

Date started 11 NOV 92 Completed 16 NOV 92

(5) WELL TEST:
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian
Permeability _____ Yield 20 GPM
Conductivity 420 uS PH 6.50
Temperature of water 14.0 °C Depth artesian flow found _____ ft.
Was water analysis done? ☒ Yes ☐ No
By whom? COMMERCIAL LAB FOR EPA
Depth of strata to be analyzed: From 93 ft. to 101 ft.
Remarks: _____

Name of supervising Geologist/Engineer D.A. HARTLEY

(unbonded) Monitor Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed _____ MWC Number _____
Date _____

(bonded) Monitor Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. A work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed _____ MWC Number _____
Date _____

MONITORING WELL REPORT

(as required by ORS 537.765 & OAR 690-240-095)

Start Card #

OWNER/PROJECT: WELL NO. DOT-6
Name: OREGON DEPT. OF TRANSPORTATION
Address: 9200 LAWFIELD
City: CLACKAMAS State: OR Zip:

(2) TYPE OF WORK:

☒ New construction. ☐ Repair ☐ Recondition
☐ Conversion. ☐ Deepening ☐ Abandonment

(3) DRILLING METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Hollow Stem Auger ☐ Other _____

(4) BORE HOLE CONSTRUCTION

Special Standards ☐ Yes ☒ No Depth of completed well 20 ft.

Vault
0 ft.
10 ft.

Seal
1 ft.
11 ft.

Filter pack
11 ft.
20 ft.

Land surface

Water-tight cover

Surface flush vault

Locking cap

Casing
diameter 4 in.
material STAINLESS

Welded Threaded Glued
☐ ☒ ☐

Liner
diameter _____ in.
material _____

Welded Threaded Glued
☐ ☐ ☐

Well seal:
Material : _____
Amount _____

Borehole diameter
10 in.

Bentonite plug at least 2 ft. thick

Screen
material STAINLESS
interval(s):
From 14 To 19
From _____ To _____
Slot size 10 to 20

Filter pack:
Material 20 SILICA SAND
Size _____ in.

(6) LOCATION OF WELL By legal description

Well Location: County CLACKAMAS
Township 2 (N or S) Range 2 (E or W) Section 9

1. NW 1/4 of NE 1/4 of above section.

2. Street address of well location

SAME AS OWNER

3. Tax lot number of well location

(7) STATIC WATER LEVEL:

5.7 ft. below land surface. Date 11-19-92
Arterial Pressure lb/sq. in. Date

(8) WATER BEARING ZONES:

Depth at which water was first found 5'

From	To	Est. Flow Rate	SWL
5	20	1-3 GPM	~5

(9) WELL LOG:

Ground elevation [illegible]

Date started 17 NOV 92 Completed 18 NOV 92

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

Signed _____
(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment of work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

Signed _____ MWC Number _____
Date _____

(5) WELL TEST:

☐ Pump ☐ Bailer ☒ Air ☐ Flowing ArtesianPermeability — Yield 1-3 GPM

Conductivity 150 μ S PH 7.40

Temperature of water 15.0 ~~15.0~~ °C Depth artesian flow found — m

Was water analysis done? ☒ Yes ☐ No

By whom? COMMERCIAL LAB FOR EPA
Depth of strata to be analyzed: From 11 ft. to 20 ft.

Remarks: _____

Name of supervising Geologist/Engineer D.A. HARTLEY

APPENDIX C

FIELD SCREENING

TECHNICAL ASSISTANCE TEAM FASP AND
COMMERCIAL LABORATORY RESULTS COMPARISON FOR:

NORTHWEST PIPE AND CASING
CLACKAMAS, OREGON

TDD T10-9210-031

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1.0 INTRODUCTION

As an integral part of the Site Assessment for Northwest Pipe and Casing, Clackamas, Oregon, groundwater and subsurface soil samples were analyzed by Ecology and Environment, Inc. (E & E) Technical Assistance Team (TAT) chemists utilizing Region 10 Field Analytical Support Project (FASP) methodologies. The samples were collected during the installation of 7 groundwater monitoring wells located on the perimeter of the site. A total of 52 subsurface soil samples and 68 groundwater samples were collected and analyzed for trichloroethene (TCE) and tetrachloroethene, also known as perchloroethylene (PERC), using a field portable Sentex Systems Scentograph gas chromatograph (GC) with an argon ionization detector coupled with a purge and trap unit. A total of 4 subsurface soil and 11 groundwater samples were submitted to a commercial laboratory. FASP analysis provided tentative identification and estimated concentrations of target analytes. Commercial laboratory confirmatory analysis provided positive identification of target analytes that were previously tentatively identified by FASP methodologies.

2.0 FASP METHODOLOGY FOR VOLATILE ORGANIC COMPOUNDS IN SOIL/SEDIMENT BY PURGE AND TRAP

The FASP method F080.001 was modified to adapt to the Sentex Systems Scentograph portable GC operating parameters. All FASP method quality control criteria were met for initial calibration, continuing calibration, final calibration, and quantitation limits. The target compounds analyzed for were TCE and PERC during the field analytical project.

2.1 Summary of Modified FASP Method

Five grams of soil/sediment, weighed to the nearest 0.01 gram, are placed into a volatile organic analysis (VOA) vial with 30 mls of deionized water. The sample was shaken for 1 minute and then transferred to the Teflon purge cup. The sample was then purged with argon to extract TCE and PERC onto a Tenax trap, or equivalent. The trapped sample is then desorbed with heat and moved along with the argon gas directly onto a packed glass column in a temperature-programmed GC. TCE and PERC were detected with an argon ionization detector. Quantitation and identification were based on sample peak areas and retention times compared to the calibration peak areas and retention times.

3.0 FASP SAMPLE ANALYSES DATA

Generally, there was a very good agreement of TCE and PERC results for the fifteen split groundwater and soil samples analyzed by TAT using FASP methodologies and the commercial laboratory using ~~United States~~ Environmental Protection Agency (EPA) Method 8240 for volatile organic compounds (VOC) (Table 1 & Table 2). The TAT and commercial laboratories were consistent in the identification of results above and at the given detection limits for all samples analyzed.

TABLE 1
SUMMARY OF ANALYTICAL RESULTS
FOR GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

*Report
only
significant
figures*

Sample	Well	Analyte	Commercial Lab		TAT Lab	
T2100121	MW-2	TCE	42.0		493.5	F
		PERC	33.0		22.7	F
T2100122	MW-4	TCE	1100.0		2188.0	F
		PERC	6200.0		2107.0	F
T2100123	MW-6	TCE	42.0		391.3	F
		PERC	5.8		17.1	F
T2100110	MW-8	TCE	10	U	5	UF
		PERC	10	U	5	UF
T2100111	MW-9	TCE	10	U	5	UF
		PERC	10	U	5	UF
T2100112	MW-10	TCE	10	U	5	UF
		PERC	10	U	5	UF
T2100113	MW-11	TCE	10	U	5	UF
		PERC	10	U	5	UF
T2100114	MW-12	TCE	10	U	5	UF
		PERC	10	U	5	UF
T2100115	DOT-5	TCE	10	U	5	UF
		PERC	10	U	5	UF
T2100116	DOT-5 *	TCE	10	U	5	UF
		PERC	10	U	5	UF
T2100117	DOT-6	TCE	3.0	J	2.7	F
		PERC	10	U	5	UF

*- Duplicate of sample T2100115.
TCE- Trichloroethene
PERC- Tetrachloroethene
MW- Monitoring Well
DOT- Department of Transportation

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

J- The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

TABLE 2
SUMMARY OF ANALYTICAL RESULTS
FOR SUBSURFACE SOIL SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

Sample	Well	Analyte	Commercial Lab		TAT Lab	
T2100100	MW-8	TCE	200	U	10	UF
		PERC	200	U	10	UF
T2100101	MW-9	TCE	300	U	10	UF
		PERC	300	U	10	UF
T2100102	MW-11	TCE	300	U	10	UF
		PERC	300	U	10	UF
T2100103	DOT-5	TCE	300	U	10	UF
		PERC	300	U	10	UF

TCE- Trichloroethene
 PERC- Tetrachloroethene
 MW- Monitoring Well
 DOT- Department of Transportation

F- The data has been generated by the Technical Assistance Team using FASP methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

FASP results were not confirmed by mass spectroscopy and, therefore, do not provide the same level of qualitative specificity as commercial or Contract Laboratory Program (CLP) data. While FASP data is not equivalent to or a replacement for commercial or CLP data, the results presented in this report correlate well between the two methods. The data generated by the TAT field laboratory for the Northwest Pipe and Casing Site Assessment were used to quantitate the extent of site contamination and to assist in the location of various monitoring wells.

4.0 STATISTICAL ANALYSIS OF FASP RESULTS

A statistical analysis was performed on the two sets of data using correlation coefficients. The correlation coefficient is defined by the equation below, and can be used to determine the correlation between two methods.

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{n S_x S_y}$$

Where: r = Correlation coefficient,
 n = Number of data pairs,
 x = TAT laboratory data point,
 Y = Commercial laboratory data point,
 S_x = Standard deviation of x , and
 S_y = Standard deviation of y .

A correlation coefficient of 1.0 represents exact correlation. TAT and commercial laboratory data sets were compared for both analytes using eleven data pairs, including results above and at the method quantitation limits. A value of zero was used when calculating correlation coefficients for results below detection limits. The calculated correlation coefficients for groundwater sample results for Northwest Pipe and Casing are summarized below. Since only four soil samples were analyzed and the results were determined to be at the method detection limits, correlation coefficients were not calculated.

Analyte	Data Pairs Used	Correlation Coefficient (r)
Trichloroethene (water)	11	0.97489
Tetrachloroethene (water)	11	0.99996

Based on commercial laboratory results and calculated correlation coefficients, TAT data for groundwater samples is acceptable for use in field screening applications to establish tentative identification and estimated quantities of target compounds for the Northwest Pipe and Casing Site Assessment.

5.0 FASP CALIBRATION DATA

5.1 Initial Calibration

A minimum of three concentrations of mixtures of TCE/PERC were used for the initial calibration. Concentrations of 50 ppb, 500 ppb and 1000 ppb TCE/PERC were used for initial calibration at the Northwest Pipe and Casing monitoring well drilling operation. Calibration factors (CF) were calculated based upon the total volume of sample, 30 milliliters, used in the purge and trap apparatus.

$$CF = \frac{\text{Area of Peak}}{\text{Volume of sample purged}}$$

Using the calibration factors, the percent relative standard deviation (%RSD) was calculated for each peak (Table 3).

$$\%RSD = \frac{SD}{\bar{X}} \times 100$$

where SD, the Standard Deviation, is given by

$$\sqrt{\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N-1}}$$

where: X_i = individual calibration factor (per analyte)
 \bar{X} = mean of initial three calibration factors
 N = number of calibration standards

The %RSD must be ≤ 25.0 percent or the instrument needs to be re-calibrated with a complete initial calibration.

5.2 Continuation Calibration

The sample quantitation was based on analyte calibration factors calculated from continuing calibrations daily. Midrange standards, 500 ppb TCE/PERC, were analyzed at varied intervals during the analysis run or at the end of the day. Sample chromatograms from runs performed during the sampling event are presented in Appendix A.

The maximum allowable relative percent difference (RPD) calculated using the equation below for each analyte must be ≤ 25 percent or an initial calibration must be rerun before analysis can continue.

$$RPD = \frac{|CF_I - CF_C|}{\frac{CF_I + CF_C}{2}} \times 100$$

TABLE 3
SUMMARY OF CALIBRATION RESULTS
FOR FASP ANALYSIS
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON

Date	Retention Time (seconds)	Analytes	Peak Areas	% RSD
<u>INITIAL CALIBRATION:</u>				
(50 ppb TCE/PERC)				
10/27/92	104	TCE	216633	15.8
	124	PERC	150536	17.5
(500 ppb TCE/PERC)				
10/27/92	104	TCE	2481163	15.8
	125	PERC	1198411	17.5
(1000 ppb TCE/PERC)				
10/27/92	104	TCE	5926615	15.8
	124	PERC	3421709	17.5
<u>CONTINUING CALIBRATION:</u>				<u>% RPD</u>
(500 ppb TCE/PERC)				
10/27/92	105	TCE	2167151	13.5
	126	PERC	1102559	8.3
10/28/92	117	TCE	2763783	10.8
	140	PERC	1319753	9.6
11/02/92*	109	TCE	856221	NA
	124	PERC	2260640	NA

TCE- Trichloroethene
PERC- Tetrachloroethene
NA- Not applicable
RSD- Relative Standard Deviation
PPD- Relative Percent Difference
PPB- parts per billion

*- Rerun of 500 ppb standard using new PCE/TCE stock solution prepared out in the field due to high RPD for daily final for previous three days. Insufficient amount of solvent to make 50 and 1000 ppb standards. RPD based upon 500 ppb standard.

TABLE 3 (cont.)
SUMMARY OF CALIBRATION RESULTS
FOR FASP ANALYSIS
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON

Date	Retention Time (seconds)	Analytes	Peak Areas	% RPD
<u>CONTINUING CALIBRATION: (cont.)</u>				
(500 ppb TCE/PERC)				
11/03/92	115	TCE	1014298	16.9
	137	PERC	2509101	10.4
11/05/92	110	TCE	955611	11.0
	132	PERC	2224552	1.6
11/06/92	125	TCE	947784	10.2
	149	PERC	2420376	6.8
11/07/92	116	TCE	872412	1.9
	138	PERC	2078878	8.4
11/11/92	107	TCE	1177061	31.5
	128	PERC	3274259	36.6
11/12/92	107	TCE	956528	11.0
	129	PERC	2434356	7.4
11/13/92	102	TCE	849111	0.8
	122	PERC	2185887	3.4
11/16/92	98	TCE	1005920	16.1
	117	PERC	2456230	8.3
11/20/92	98	TCE	887586	3.6
	118	PERC	2557395	12.3

TCE- Trichloroethene
PERC- Tetrachloroethene
NA- Not applicable
RPD- Relative Percent Difference
PPB- parts per billion

**TABLE 3 (cont.)
SUMMARY OF CALIBRATION RESULTS
FOR FASP ANALYSIS
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON**

Date	Retention Time (seconds)	Analytes	Peak Areas	% RPD
DAILY/FINAL CALIBRATION:				
(500 ppb TCE/PERC)				
10/27/92	134	TCE	3834564	42.9
	160	PERC	2249746	61.0
10/28/92	133	TCE	5453315	74.9
	159	PERC	3201621	91.1
10/29/92	135	TCE	1257794	65.4
	162	PERC	4058686	108.8
10/31/92	NA			
11/02/92*	130	TCE	768573	10.8
	156	PERC	2593310	13.7
11/03/92	NA			
11/05/92	109	TCE	724044	16.7
	130	PERC	1886119	18.1
11/06/92	NA			
11/07/92	NA			

TCE- Trichloroethene
 PERC- Tetrachloroethene
 NA- Not applicable/Not performed
 RSD- Relative Percent Difference
 PPB- parts per billion

*- Rerun of 500 ppb standard using new PCE/TCE stock solution prepared out in the field due to high RPD for daily final for previous three days. Insufficient amount of solvent to make 50 and 1000 ppb standards. RPD based upon 500 ppb standard.

where: CF_I = mean CF from the initial calibration for each analyte
 CF_C = measured CF from the continuing calibration or daily calibration for the same analyte

6.0 METHOD BLANK DATA

Method blanks were analyzed each day using deionized water for sample analysis (Table 4). The method blank was analyzed immediately after and prior to sample analysis to insure that there was no sample carry-over after continuing calibration was verified. Two method blanks showed positive results for PERC, however, the results were below detection limits and may have been caused by contaminant carry-over during pre-site assessment activities.

7.0 MATRIX SPIKE DATA

Matrix spikes were done on two soil samples previously identified as nondetect at the given detection limits. One sample was spiked with 2 μ g of PERC (41 μ l/l diluent) and another with 10 μ g of PERC (205 μ l/l diluent). Both samples were analyzed using purge and trap. The results were 7.5 μ l/l of PERC for the first sample, representing an 18% recovery, and 20.4 μ l/l of PERC for the second sample, representing a 10% recovery. Possible explanations for the low recovery could be the low temperature of the sample resulting in ineffective purging or mobilization of contaminants, inefficient purging technique leading to loss of contaminant, or insolubility of the standard in the deionized water diluent. The use of a water bath in conjunction with a purge and trap unit that utilizes heated purge lines and needles capable of being directly injected into the septum of the sample vial may help to increase efficiency.

8.0 DUPLICATE SAMPLE DATA

Duplicate samples were run on approximately 10% of the positive and nondetected results during the sampling event. Only the positive duplicate results were listed in Table 5 to provide information on method precision.

9.0 INSTRUMENT OPERATING PARAMETERS

Instrument:	Sentex Scentograph
Calibrant:	500 ppb TCE/PERC
Sample Time:	30 seconds
Delay/Desorption Time:	4 seconds
Inhibit Time:	65 seconds
Oven Temperature:	55 degrees Celsius
Chart Duration:	5 minutes
Column Type:	3% Supelcoport-1000 packed column
Detector Type:	Argon Ionization Detector
Final Temperature:	55 degrees Celsius
Initial Gain:	5
Column Pressure:	20 pounds per square inch
Enable External Purge:	5

TABLE 4
SUMMARY OF METHOD BLANK RESULTS
FOR FASP ANALYSIS
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

Sample	Well	Date	Analyte	TAT Lab	
WATER BLK	MW-08	10/27/92	TCE	10	UF
			PERC	2	F
WATER BLK	MW-09	11/02/92	TCE	10	UF
			PERC	2	F
WATER BLK	MW-10	11/05/92	TCE	10	UF
			PERC	10	UF
WATER BLK	MW-11	11/06/92	TCE	10	UF
			PERC	10	UF
WATER BLK	DOT-5	11/11/92	TCE	10	UF
			PERC	10	UF
WATER BLK	DOT-6	11/16/92	TCE	10	UF
			PERC	10	UF
WATER BLK	MW-01	11/16/92	TCE	10	UF
			PERC	10	UF
WATER BLK	MW-02	11/16/92	TCE	10	UF
			PERC	10	UF
WATER BLK	MW-03	11/16/92	TCE	10	UF
			PERC	10	UF
WATER BLK	MW-04	11/16/92	TCE	10	UF
			PERC	10	UF
WATER BLK	MW-05	11/16/92	TCE	10	UF
			PERC	10	UF
WATER BLK	MW-06	11/16/92	TCE	10	UF
			PERC	10	UF
WATER BLK	MW-07	11/16/92	TCE	10	UF
			PERC	10	UF

TCE- Trichloroethene
PERC- Tetrachloroethene
MW- Monitoring Well
DOT- Department of Transportation
BLK- Blank

F- The data has been generated by the Technical Assistance Team using FASP methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

TABLE 5
SUMMARY OF DUPLICATE SAMPLE RESULTS
FOR GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

Sample	Well	Analyte	Result		Date	Time
MW-9-8W	MW-9	TCE	8.7	F	11/02/92	13:21
MW-9-8WD	MW-9	TCE	8.2	F	11/02/92	13:40
DOT-5-8W	DOT-5	PERC	1.5	F	11/12/92	11:11
DOT-5-8WD	DOT-5	PERC	1.8	F	11/12/92	11:23
MW-2-W	MW-2	TCE	493.5	F	11/16/92	12:15
		PERC	22.7	F		
MW-2-WD	MW-2	TCE	407.4	F	11/16/92	17:33
		PERC	24.3	F		
DOT-6-W	DOT-6	TCE	2.7	F	11/20/92	11:41
DOT-6-WD	DOT-6	TCE	2.6	F	11/20/92	11:53

W- Water
WD- Water Duplicate
TCE- Trichloroethene
PERC- Tetrachloroethene
MW- Monitoring Well
DOT- Department of Transportation

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

10.0 CONCLUSION

Subsurface Soil and groundwater samples were analyzed by the TAT FASP laboratory to acquire immediate analytical data as an integral part of the Northwest Pipe and Casing monitoring well drilling operation. The samples were analyzed for TCE and PERC using modified FASP methodologies. FASP data provided tentative identification of previously identified target analytes, at estimated concentrations. Confirmatory analysis was performed by a commercial laboratory on split samples at a frequency of 8 percent for soils and 16 percent. The purpose of confirmatory analysis was to provide positive identification of target analytes previously identified by the TAT laboratory. Correlation between the TAT and the commercial laboratory was excellent. TAT identification of TCE and PERC was confirmed by the commercial laboratory, and relative trends in analyte concentrations generally agreed.

Based on commercial laboratory confirmation results, TAT FASP data was determined to be acceptable for use in establishing tentative identification and estimated quantities of TCE and PERC for the Northwest Pipe and Casing Site.

APPENDIX A
SAMPLE CHROMATOGRAMS

SCENTOGRAPH TRACE PRINOUT

TRACE #265 DATE: Wed Nov 11 14:25:54 1992

CHANNEL: 1 NAME: DOT-5-2W

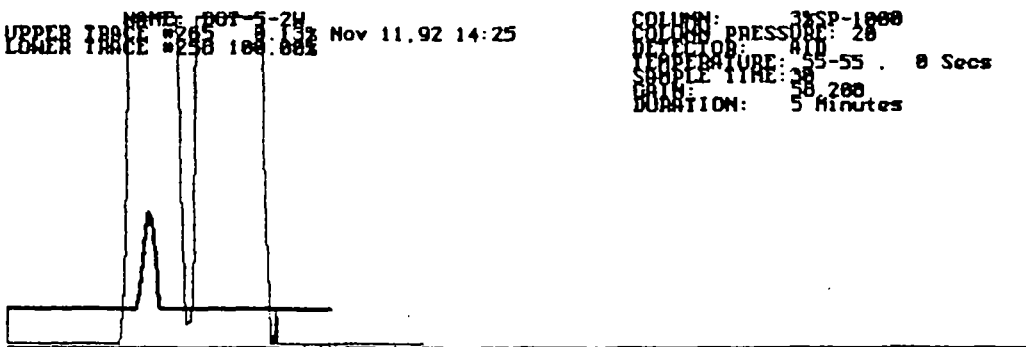
COLUMN: 3%SP-1000 DETECTOR: AID

COLUMN PRESSURE: 20

TEMPERATURE: 55 INHIBIT TIME: 65 Seconds

PEAK#	NAME	RT	AREA	CONCENTRATION
-------	------	----	------	---------------

1	TCE	106	5686	2.415 PPB
TOTAL AREA:			5686	

NAME: DOT-5-2W
UPPER TRACE #265 8.13% Nov 11.92 14:25
LOWER TRACE #250 100.00%COLUMN: 3%SP-1000
COLUMN PRESSURE: 20
DETECTOR: AID
TEMPERATURE: 55-55 . 0 Secs
SAMPLE TIME: 30
DURATION: 5 minutes

SCENTOGRAPH TRACE PRINOUT

TRACE #370 DATE: Mon Nov 16 12:19:32 1992

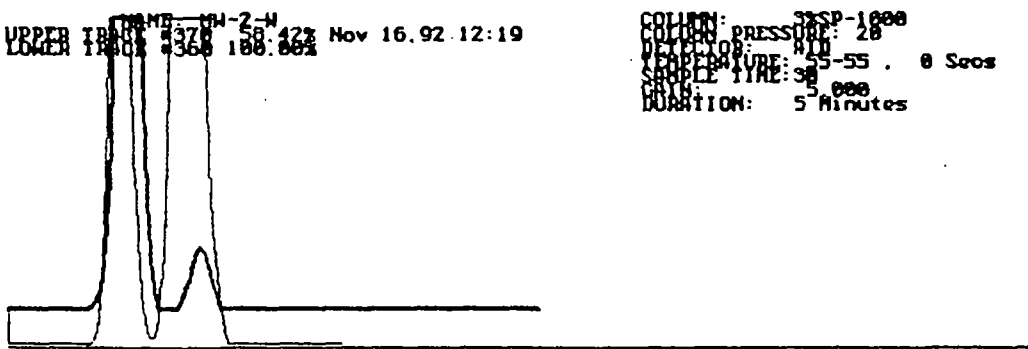
CHANNEL: 1 NAME: MW-2-W
 COLUMN: 3%SP-1000 DETECTOR: AID
 COLUMN PRESSURE: 20
 TEMPERATURE: 55 INHIBIT TIME: 65 Seconds
PEAK# NAME RT AREA CONCENTRATION

1 TCE 100 1777949 883.743 PPB
 2 PERC 121 244515 49.774 PPB

TOTAL AREA: 2022464

UPPER TRACE: MW-2-W
 LOWER TRACE: 370 Nov 16.92 12:19

COLUMN: 3%SP-1000
 COLUMN PRESSURE: 20
 DETECTOR: AID
 TEMPERATURE: 55-55 . 0 Secs
 SAMPLE TYPE: 30
 DURATION: 5 Minutes



SCENTOGRAPH TRACE PRINOUT

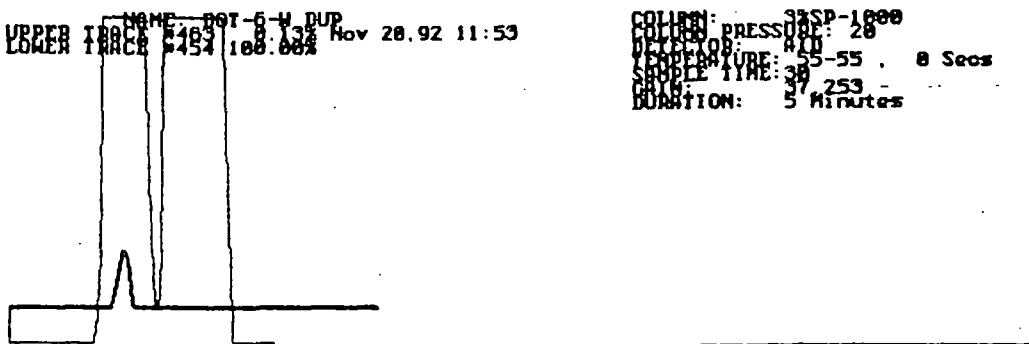
TRACE #463 DATE: Fri Nov 20 11:53:45 1992

CHANNEL: 1 NAME: DOT-6-W DUP
 COLUMN: 3%SP-1000 DETECTOR: AID
 COLUMN PRESSURE: 20
 TEMPERATURE: 55 INHIBIT TIME: 65 Seconds
 PEAK# NAME RT AREA CONCENTRATION

1 TCE 98 4626 2.606 PPB
 TOTAL AREA: 4626

NAME: DOT-6-W DUP
 UPPER TRACE #463 8.13 Nov 20.92 11:53
 LOWER TRACE #454 100.00%

COLUMN: 3%SP-1000
 COLUMN PRESSURE: 20
 DETECTOR: AID
 TEMPERATURE: 55-55 8 Secs
 INHIBIT TIME: 65
 SAMPLE TIME: 37.253
 DURATION: 5 Minutes



APPENDIX B
SUMMARY OF ANALYTICAL RESULTS
FOR
SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT

**SUMMARY OF ANALYTICAL RESULTS
FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
($\mu\text{g/L}$)**

Sample	Analyte	TAT Lab	
MW-8-1S	TCE	10	UF
	PERC	10	UF
MW-8-2S	TCE	10	UF
	PERC	10	UF
MW-8-3S	TCE	10	UF
	PERC	10	UF
MW-8-4S	TCE	10	UF
	PERC	10	UF
MW-8-5S	TCE	10	UF
	PERC	10	UF
MW-8-6S	TCE	10	UF
	PERC	10	UF
MW-8-7S	TCE	10	UF
	PERC	10	UF
MW-8-8S	TCE	10	UF
	PERC	10	UF
MW-8-9S	TCE	10	UF
	PERC	10	UF
MW-8-10S	TCE	10	UF
	PERC	10	UF
MW-8-11S	TCE	10	UF
	PERC	10	UF
MW-8-12S	TCE	10	UF
	PERC	10	UF
MW-8-14S	TCE	10	UF
	PERC	10	UF

TCE- Trichloroethene
 PERC- Tetrachloroethene
 MW- Monitoring Well
 S- Soil sample

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SUMMARY OF ANALYTICAL RESULTS (cont.)
FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

Sample	Analyte	TAT Lab	
MW-8-15S	TCE	10	UF
	PERC	10	UF
MW-8-16S	TCE	10	UF
	PERC	10	UF
MW-8-17S	TCE	10	UF
	PERC	10	UF
MW-8-18S	TCE	NA	
	PERC	NA	
MW-8-19S	TCE	NA	
	PERC	NA	
MW-9-1W	TCE	5	UF
	PERC	5	UF
MW-9-1S	TCE	10	UF
	PERC	10	UF
MW-9-2W	TCE	5	UF
	PERC	5	UF
MW-9-3W	TCE	5	UF
	PERC	5	UF
MW-9-3S	TCE	10	UF
	PERC	10	UF
MW-9-5W	TCE	7	F
	PERC	5	UF
MW-9-5S	TCE	10	UF
	PERC	10	UF
MW-9-6W	TCE	5	UF
	PERC	5	UF

TCE- Trichloroethene
PERC- Tetrachloroethene

MW- Monitoring Well

S- Soil

W- Water

NA- Not Analyzed or reported due to sample carryover problems

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SUMMARY OF ANALYTICAL RESULTS (cont.)
 FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
 NORTHWEST PIPE AND CASING SITE ASSESSMENT
 CLACKAMAS, OREGON
 (µg/L)

Sample	Analyte	TAT Lab	
MW-9-6S	TCE	10	UF
	PERC	10	UF
MW-9-7W	TCE	3	F
	PERC	5	UF
MW-9-7S	TCE	10	UF
	PERC	10	UF
MW-9-8W	TCE	9	F
	PERC	5	UF
MW-9-8WD	TCE	8	F
	PERC	5	UF
MW-9-9W	TCE	5	UF
	PERC	5	UF
MW-9-10W	TCE	5	UF
	PERC	5	UF
MW-9-10S	TCE	10	UF
	PERC	10	UF
MW-9-11W	TCE	5	UF
	PERC	5	UF
MW-9-11S	TCE	10	UF
	PERC	10	UF
MW-9-12W	TCE	5	UF
	PERC	5	UF
MW-9-12S	TCE	10	UF
	PERC	10	UF

TCE- Trichloroethene
 PERC- Tetrachloroethene
 MW- Monitoring Well
 S- Soil
 W- Water

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

**SUMMARY OF ANALYTICAL RESULTS (cont.)
FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)**

Sample	Analyte	TAT Lab	
MW-9-13W	TCE	5	UF
	PERC	5	UF
MW-9-14W	TCE	5	UF
	PERC	5	UF
MW-9-15W	TCE	5	UF
	PERC	5	UF
MW-9-15S	TCE	10	UF
	PERC	10	UF
MW-9-16W	TCE	5	UF
	PERC	5	UF
MW-9-17W	TCE	5	UF
	PERC	5	UF
MW-9-17S	TCE	10	UF
	PERC	10	UF
MW-10-1W	TCE	1	F
	PERC	5	UF
MW-10-2W	TCE	2	F
	PERC	5	UF
MW-11-1W	TCE	5	UF
	PERC	5	UF
MW-11-1S	TCE	10	UF
	PERC	10	UF
MW-11-2W	TCE	5	UF
	PERC	5	UF
MW-11-2S	TCE	10	UF
	PERC	10	UF

TCE- Trichloroethene
 PERC- Tetrachloroethene
 MW- Monitoring Well
 S- Soil
 W- Water

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SUMMARY OF ANALYTICAL RESULTS (cont.)
FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

Sample	Analyte	TAT Lab	
MW-11-3W	TCE	5	UF
	PERC	5	UF
MW-11-3S	TCE	10	UF
	PERC	10	UF
MW-11-4W	TCE	5	UF
	PERC	5	UF
MW-11-5S	TCE	10	UF
	PERC	10	UF
MW-11-5W	TCE	5	UF
	PERC	5	UF
MW-11-6W	TCE	5	UF
	PERC	5	UF
MW-11-6S	TCE	10	UF
	PERC	10	UF
MW-11-7W	TCE	5	UF
	PERC	5	UF
MW-11-8W	TCE	5	UF
	PERC	5	UF
MW-11-9W	TCE	5	UF
	PERC	5	UF
MW-11-10W	TCE	5	UF
	PERC	5	UF
MW-11-11W	TCE	5	UF
	PERC	5	UF
MW-11-12W	TCE	5	UF
	PERC	5	UF

TCE- Trichloroethene
PERC- Tetrachloroethene
MW- Monitoring Well
S- Soil
W- Water

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U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SUMMARY OF ANALYTICAL RESULTS (cont.)
FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

Sample	Analyte	TAT Lab	
MW-11-13W	TCE	5	UF
	PERC	5	UF
MW-11-13S	TCE	10	UF
	PERC	10	UF
MW-11-14S	TCE	10	UF
	PERC	10	UF
DOT-5-1W	TCE	5	UF
	PERC	5	UF
DOT-5-1S	TCE	10	UF
	PERC	10	UF
DOT-5-2W	TCE	2	F
	PERC	5	UF
DOT-5-2S	TCE	10	UF
	PERC	10	UF
DOT-5-3W	TCE	5	UF
	PERC	5	UF
DOT-5-3S	TCE	10	UF
	PERC	10	UF
DOT-5-4W	TCE	5	UF
	PERC	5	UF
DOT-5-4S	TCE	10	UF
	PERC	10	UF

TCE- Trichloroethene
PERC- Tetrachloroethene
MW- Monitoring Well
DOT- Department of Transportation
S- Soil
W- Water

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U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SUMMARY OF ANALYTICAL RESULTS (cont.)
FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

Sample	Analyte	TAT Lab	
DOT-5-5S	TCE	10	UF
	PERC	10	UF
DOT-5-6W	TCE	5	UF
	PERC	5	UF
DOT-5-6S	TCE	10	UF
	PERC	10	UF
DOT-5-7W	TCE	5	UF
	PERC	5	UF
DOT-5-7S	TCE	10	UF
	PERC	10	UF
DOT-5-8W	TCE	5	UF
	PERC	3	F
DOT-5-8S	TCE	10	UF
	PERC	10	UF
DOT-5-9W	TCE	5	UF
	PERC	5	UF
DOT-5-9S	TCE	10	UF
	PERC	10	UF
DOT-5-10W	TCE	5	UF
	PERC	5	UF
DOT-5-10S	TCE	10	UF
	PERC	10	UF
DOT-5-11W	TCE	5	UF
	PERC	5	UF

TCE- Trichloroethene
PERC- Tetrachloroethene
MW- Monitoring Well
DOT- Department of Transportation
S- Soil
W- Water

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

**SUMMARY OF ANALYTICAL RESULTS (cont.)
FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)**

Sample	Analyte	TAT Lab	
DOT-5-11S	TCE	10	UF
	PERC	10	UF
DOT-5-12W	TCE	5	UF
	PERC	5	UF
DOT-5-12S	TCE	10	UF
	PERC	10	UF
DOT-5-13W	TCE	5	UF
	PERC	5	UF
DOT-5-13S	TCE	10	UF
	PERC	10	UF
DOT-5-14W	TCE	5	UF
	PERC	5	UF
DOT-5-14S	TCE	10	UF
	PERC	10	UF
DOT-5-15W	TCE	5	UF
	PERC	5	UF
DOT-5-15S	TCE	10	UF
	PERC	10	UF
DOT-5-17W	TCE	5	UF
	PERC	5	UF
DOT-5-18W	TCE	5	UF
	PERC	5	UF
DOT-5-19W	TCE	5	UF
	PERC	5	UF
DOT-5-19S	TCE	10	UF
	PERC	10	UF

TCE- Trichloroethene
 PERC- Tetrachloroethene
 MW- Monitoring Well
 DOT- Department of Transportation
 S- Soil
 W- Water

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SUMMARY OF ANALYTICAL RESULTS (cont.)
FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
NORTHWEST PIPE AND CASING SITE ASSESSMENT
CLACKAMAS, OREGON
(µg/L)

Sample	Analyte	TAT Lab	
MW-3-W	TCE	5	UF
	PERC	5	UF
MW-5-W	TCE	5	UF
	PERC	5	UF
MW-2-W	TCE	490	F
	PERC	22	F
MW-7-W	TCE	420	F
	PERC	17	F
MW-1-W	TCE	140	F
	PERC	360	F
MW-6-W	TCE	390	F
	PERC	17	F
MW-4-W	TCE	2200	F
	PERC	2100	F
DOT-1-W	TCE	5	UF
	PERC	1	F
DOT-2-W	UNKNOWN	44	F
	TCE	5	UF
DOT-3-W	PERC	5	UF
	TCE	5	UF
DOT-4-W	PERC	5	UF
	TCE	5	UF
DOT-5-W	PERC	5	UF
	TCE	5	UF
DOT-6-W	TCE	3	F
	PERC	5	UF

TCE- Trichloroethene
 PERC- Tetrachloroethene
 MW- Monitoring Well
 DOT- Department of Transportation
 S- Soil
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F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

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SUMMARY OF ANALYTICAL RESULTS (cont.)
 FOR SUBSURFACE SOIL AND GROUNDWATER SAMPLES
 NORTHWEST PIPE AND CASING SITE ASSESSMENT
 CLACKAMAS, OREGON
 (µg/L)

Sample	Analyte	TAT Lab	
MW-9-W	TCE	5	UF
	PERC	5	UF
MW-12-W	TCE	5	UF
	PERC	5	UF
MW-11-W	TCE	5	UF
	PERC	5	UF

TCE- Trichloroethene
 PERC- Tetrachloroethene
 MW- Monitoring Well
 DOT- Department of Transportation
 S- Soil
 W- Water

F- The data has been generated by the Technical Assistance Team using FASP Methodologies. Analytes are tentatively identified and concentrations are quantitative estimates.

U- The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit

APPENDIX D

QUALITY ASSURANCE REVIEW

KEY TO TAT SAMPLE NUMBERS

TAT Sample Numbers	Matrix	Sample Location (Well)
T2100121	Water	MW-2
T2100122	Water	MW-4
T2100123	Water	MW-6
T2100110	Water	MW-8
T2100111	Water	MW-9
T2100112	Water	MW-10
T2100113	Water	MW-11
T2100114	Water	MW-12
T2100115	Water	ODOT-5
T2100116	Water	ODOT-5 Dup.
T2100117	Water	ODOT-6
T2100124	Water	Trip Blank
T2100125	Water	Trip Blank
T2100104	Water	Trench-2
T2100105	Water	Trench-4
T2100106	Water	Trench-1
T2100120	Water	Purge Water
T2100100	Soil	MW-8
T2100101	Soil	MW-9
T2100102	Soil	MW-11
T2100103	Soil	ODOT-5
T2100118	Soil	Drill Cuttings
T2100119	Soil	Drill Cuttings



ecology and environment, inc.

1500 FIRST INTERSTATE BUILDING, 999 THIRD AVENUE, SEATTLE, WASHINGTON 98104, TEL. (206) 624-9537
International Specialists in the Environment

MEMORANDUM

DATE: January 26, 1993

TO: Dawn Hartley, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, TAT-Chemist, E & E, Seattle, WA *MW*

THRU: David Byers, TAT-Chemist, E & E, Seattle, WA *DRB*

SUBJ: Organic Data Quality Assurance Review, Northwest Pipe and Casing, Clackamas, Oregon

REF: Project TDD: T10-9210-031 Analytical TDD: T10-9210-058
Project PAN: EOR-0201-SC Analytical PAN: EOR-0202-AB

The data quality assurance review of 17 water and 2 soil samples collected from the Northwest Pipe and Casing site in Clackamas, Oregon, has been completed. Analysis for Volatile Organic Compounds (EPA method 8240) was performed by Sound Analytical Services, Tacoma, Washington.

The 19 samples were numbered:

T2100104	T2100105	T2100106	T2100110	T2100111
T2100112	T2100113	T2100114	T2100115	T2100116
T2100117	T2100118(soil)	T2100119(soil)	T2100120	T2100121
T2100122	T2100123	T2100124	T2100125	

Data Qualifications:

I Holding Time: Acceptable.

Samples T2100104, T2100105, and T2100106 were collected 11-18-92. Samples T2100110 through sample T2100117 were collected on 11-19-92. Samples T2100118, T2100119, T2100120, T2100124, and T2100125 were collected 11-20-92. Samples T2100121, T2100122, and T2100123 were collected 11-14-92. All samples were analyzed on or before 12-01-92. All samples were analyzed within QC criteria of 14 days from collection to analysis.

II GC/MS Tuning: Acceptable.

All tuning check compound mass abundances and ratios were within contract-required limits for volatile analysis.

III Calibration

A. Initial Calibration: Satisfactory.

All System Performance Check Compounds (SPCCs) were within contract-required limits for the initial calibration with average Relative Response Factors (RRFs) above 0.05 for volatiles, except:

<u>Date</u>	<u>Compound</u>	<u>RRF</u>	<u>QC Limits</u>	<u>Associated Samples</u>
11-11-92	Acetone	0.031	> 0.050	a
	2-Butanone	0.009	> 0.050	
12-01-92	Acetone	0.033	> 0.050	b
	2-Butanone	0.012	> 0.050	

a - T2100104 through T2100117

b - T2100118, T2100119, T2100120

Positive results were flagged as estimated quantities (J) and sample quantitation limits for acetone and 2-butanone were rejected (R) in all samples.

All Calibration Check Compounds (CCCs) and non-CCCs were within contract-required limits for the initial calibration with Percent Relative Standard Deviations (RSDs) below 30 percent, except:

<u>Date</u>	<u>Compound</u>	<u>RSD</u>	<u>QC Limits</u>	<u>Associated Samples</u>
11-11-92	m&p-xylene	36.5%	< 30%	a
12-01-92	Ethyl benzene	35.3%	< 30%	b
12-01-92	m&p-xylene	49.0%	< 30%	
12-01-92	o-xylene	32.0%	< 30%	

a - T2100104 through T2100117

b - T2100118, T2100119, T2100120

No action was taken based on the continuing calibration QC outliers as none of the outliers were detected in any samples.

B. Continuing Calibration: Satisfactory.

All System Performance Check Compounds (SPCCs) were within contract-required limits for the continuing calibration with average Relative Response Factors (RRFs) above 0.05 for volatiles, except:

Date	Compound	RRF	QC Limits	Associated Samples
11-24-92	2-Butanone	0.039	> 0.050	a
11-25-92	2-Butanone	0.020	> 0.050	b
a - T2100104, T2100105, T2100106, T2100111, T2100112, T2100113, T2100114				
b - T2100110, T2100115, T2100116, T2100117, T2100121, T2100122, T2100123, T2100124, T2100125				

Positive results for 2-butanone were flagged as estimated quantities (J) in all samples. Sample quantitation limits for 2-butanone were rejected (R) in all samples.

All Calibration Check Compounds (CCCs) and non-CCCs were within contract-required limits for the continuing calibration with Percent Relative Standard Deviations (RSDs) below 25 percent, except:

Date	Compound	RSD	QC Limits	Associated Samples
11-24-92	Acetone	42.8%	< 25%	a
11-24-92	Methylene Chloride	31.0%	< 25%	
11-24-92	1,1-Dichloroethane	42.8%	< 25%	
11-24-92	1,2-Dichloroethene	27.4%	< 25%	
11-24-92	1,2-Dichloroethane	70.0%	< 25%	
11-24-92	2-Butanone	343.8%	< 25%	
11-24-92	1,1,1-Trichloroethane	56.6%	< 25%	
11-24-92	Carbon tetrachloride	49.8%	< 25%	
11-24-92	Styrene	26.4%	< 25%	
11-24-92	Bromodichloromethane	47.0%	< 25%	
11-24-92	c-1,3-dichloropropane	26.6%	< 25%	
11-24-92	Dibromochloromethane	29.2%	< 25%	
11-24-92	Benzene	29.5%	< 25%	
11-24-92	t-1,3-dichloropropane	27.3%	< 25%	
11-24-92	4-Methyl-2-pentanone	40.5%	< 25%	
11-24-92	2-Hexanone	193.2%	< 25%	
11-24-92	1,1,2,2-Tetrachloroethane	36.4%	< 25%	
11-24-92	m&p-xylene	53.1%	< 25%	
11-24-92	o-xylene	40.3%	< 25%	

Date	Compound	RSD	QC Limits	Associated Samples
11-25-92	Acetone	145.9%	< 25%	b
11-25-92	Methylene Chloride	66.5%	< 25%	
11-25-92	Chloromethane	25.9%	< 25%	
11-25-92	1,2-Dichloroethane	41.7%	< 25%	
11-25-92	2-Butanone	129.3%	< 25%	
11-25-92	1,1,1-Trichloroethane	32.3%	< 25%	
11-25-92	Carbon tetrachloride	91.4%	< 25%	
11-25-92	Bromodichloromethane	33.4%	< 25%	
11-25-92	Dibromochloromethane	29.2%	< 25%	
11-25-92	2-Hexanone	61.0%	< 25%	
11-25-92	Bromoform	39.0%	< 25%	
11-25-92	m&p-xylene	33.1%	< 25%	
a - T2100104, T2100105, T2100106, T2100111, T2100112, T2100113, T2100114				
b - T2100110, T2100115, T2100116, T2100117, T2100121, T2100122, T2100123, T2100124, T2100125				

Positive results and sample quantitation limits for the RRF QC outliers were flagged as estimated quantities (J) in samples.

IV Method Blank: Satisfactory.

The following compounds were detected in blanks:

Blank	Date	Compound	Concentration	Associated Samples
M. Blank	11-24-92	Methylene Chloride	3.3 ug/L	a
M. Blank	11-25-92	Methylene Chloride	6.0 ug/L	b
		Toluene	1.3 ug/L	
		Ethylbenzene	1.3 ug/L	
		m&p-xylene	1.5 ug/L	
M. Blank	12-01-92	Methylene Chloride	3.8 ug/L	c
M. Blank	11-24-92	Methylene Chloride	240 ug/Kg	T2100118
M. Blank	11-25-92	Methylene Chloride	360 ug/Kg	T2100119
a - T2100105, T2100106, T2100112, T2100113, T2100114, T2100117				
b - T2100104, T2100110, T2100111, T2100115, T2100116, T2100120, T2100121, T2100125				
c - T2100122, T2100123, T2100124				

Results for the compound detected in the blanks were flagged as not detected (U) in the associated samples if the amount detected in the samples was less than 5 times the amount detected in the blank (10 times for common contaminants).

V Surrogate Recovery: Acceptable.

Recoveries for all surrogate compounds met QC criteria.

VI Matrix Spike/Matrix Spike Duplicates: Acceptable.

All matrix spike/matrix spike duplicate analyses met QC criteria.

VII Internal Standards: Acceptable.

All internal standard results were within QC limits.

VIII Field Duplicates: Not Applicable.

IX Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Directive "National Functional Guidelines for Organic Data Review" (June 1991).

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

- J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
- R - Quality Control indicates that data are unusable for all purposes. The analyte was analyzed for, but the presence or absence of the analyte has not been verified. Resampling and reanalysis are necessary for verification to confirm or deny the presence of an analyte.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Ecology & Environment

Date: December 21, 1992

Report On: Analysis of Water & Soil

Lab No.: 28636

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IDENTIFICATION:

Samples Received on 11-23-92

Project: T109210031

ANALYSIS:

Lab No. 28636-1

Client ID: T2100114 (water)

Volatile Organics by Method 8240

Date Analyzed: 11-24-92

Compound	Concentration ug/l		
Chloromethane		20 U	
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20 ↓	
Methylene Chloride	22 U J		
Acetone		100 U	R
Carbon Disulfide		10	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10 ↓	

Continued

SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-1

Client ID: T2100114 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10	U
Trans-1,3-Dichloropropene		10	U
Bromoform		10	U
4-Methyl-2-Pentanone		50	U
2-Hexanone		10	U
Tetrachloroethene		10	U
1,1,2,2-Tetrachloroethane		10	U
Toluene		10	U
Chlorobenzene		10	U
Ethyl Benzene		10	U
Styrene		10	U
Total Xylenes		10	U

mm
 1-26-9

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Lab No. 28636-2

Client ID: T2100112 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-24-92

Compound	Concentration ug/l		
Chloromethane		20	U
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	V
Methylene Chloride	20	U	J
Acetone		100	U
Carbon Disulfide		10	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

ND = Not Detected

MAR 1-26-93

Continued

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Lab No. 28636-2

Client ID: T2100112 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10	u
Trans-1,3-Dichloropropene		10	h
Bromoform		10	h
4-Methyl-2-Pentanone		50	h
2-Hexanone		10	h
Tetrachloroethene		10	h
1,1,2,2-Tetrachloroethane		10	h
Toluene		10	h
Chlorobenzene		10	h
Ethyl Benzene		10	h
Styrene		10	h
Total Xylenes		10	h

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Lab No. 28636-3

Client ID: T2100113 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-24-92

Compound	Concentration ug/l		
Chloromethane		20 U	
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	22 U J	10	
Acetone	5.0	10	
Carbon Disulfide		10 U	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10 V	

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Lab No. 28636-3

Client ID: T2100113 (water)

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Compound	Concentration ug/l		
Benzene		10	U
Trans-1,3-Dichloropropene		10	U
Bromoform		10	U
4-Methyl-2-Pentanone		50	U
2-Hexanone		10	U
Tetrachloroethene		10	U
1,1,2,2-Tetrachloroethane		10	U
Toluene		10	U
Chlorobenzene		10	U
Ethyl Benzene		10	U
Styrene		10	U
Total Xylenes		10	U

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Lab No. 28636-4

Client ID: T2100104 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-25-92

Compound	Concentration ug/l		
Chloromethane		20	U
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	↓
Methylene Chloride	28 U J		
Acetone	5.0		
Carbon Disulfide		10	U
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	↓

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Lab No. 28636-4

Client ID: T2100104 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10	0
Trans-1,3-Dichloropropene		10	
Bromoform		10	
4-Methyl-2-Pentanone		50	
2-Hexanone		10	
Tetrachloroethene		10	
1,1,2,2-Tetrachloroethane		10	
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	

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Lab No. 28636-5

Client ID: T2100105 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-24-92

Compound	Concentration ug/l		
Chloromethane		20 U	
Bromomethane		20 U	
Vinyl Chloride	37		
Chloroethane		20 U	
Methylene Chloride	22 U J		
Acetone		100 U	R
Carbon Disulfide		10	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone		10	
1,1,1-Trichloroethane		50	
Carbon Tetrachloride		10	
Vinyl Acetate		10	
Bromodichloromethane		50	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

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Lab No. 28636-5

Client ID: T2100105 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene	--	100	5
Trans-1,3-Dichloropropene		10	5
Bromoform		10	5
4-Methyl-2-Pentanone		50	4
2-Hexanone		10	4
Tetrachloroethene		10	4
1,1,2,2-Tetrachloroethane		10	4
Toluene		10	4
Chlorobenzene		10	4
Ethyl Benzene		10	4
Styrene		10	4
Total Xylenes		10	4

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Lab No. 28636-6

Client ID: T2100106 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-24-92

Compound	Concentration ug/l		
Chloromethane		20U	
Bromomethane		20U	
Vinyl Chloride		20U	
Chloroethane		20U	
Methylene Chloride	22 UJ	20U	
Acetone		100U	R
Carbon Disulfide		10	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10U	

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Lab No. 28636-6

Client ID: T2100106 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10	0
Trans-1,3-Dichloropropene		10	5
Bromoform		10	4
4-Methyl-2-Pentanone		50	4
2-Hexanone		10	4
Tetrachloroethene		10	4
1,1,2,2-Tetrachloroethane		10	4
Toluene		10	4
Chlorobenzene		10	4
Ethyl Benzene		10	4
Styrene		10	4
Total Xylenes		10	4

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Lab No. 28636-7

Client ID: T2100117 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-24-92

Compound	Concentration ug/l		
Chloromethane		20 U	J
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	24 U	J	
Acetone		100 U	R
Carbon Disulfide		10	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	J
1,2-Dichloroethane		10	
2-Butanone		50	R
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	J
Vinyl Acetate		50	
Bromodichloromethane		10	J
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene	3.0		J
Dibromochloromethane		10 U	
1,1,2-Trichloroethane		10 U	

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Lab No. 28636-7

Client ID: T2100117 (water)

8240 Continued . . .

Compound	Concentration ug/l	PQL	Flag
Benzene		10 U	
Trans-1,3-Dichloropropene		10	
Bromoform		10	J
4-Methyl-2-Pentanone		50	
2-Hexanone		10	J
Tetrachloroethene		10	
1,1,2,2-Tetrachloroethane		10	
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	J

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Lab No. 28636-8

Client ID: T2100118 (soil)

Volatile Organics by Method 8240
 Date Extracted: 11-24-92
 Date Analyzed: 11-24-92

Compound	Concentration ug/kg		
Chloromethane		600 U	
Bromomethane		600	
Vinyl Chloride		600	
Chloroethane		600	
Methylene Chloride	980 U J	600	
Acetone		3,000 U R	
Carbon Disulfide		300	
1,1-Dichloroethene		300	
1,1-Dichloroethane		300	
1,2-Dichloroethene (Total)		300	
Chloroform		300	
1,2-Dichloroethane		300	
2-Butanone		1,500	
1,1,1-Trichloroethane		300	
Carbon Tetrachloride		300	
Vinyl Acetate		1,500	
Bromodichloromethane		300	
1,2-Dichloropropane		300	
Cis-1,3-Dichloropropene		300	
Trichloroethene		300	
Dibromochloromethane		300	
1,1,2-Trichloroethane		300 V	

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Lab No. 28636-8

Client ID: T2100118 (soil)

8240 Continued . . .

Compound Flag	Concentration ug/kg		
Benzene		300	U
Trans-1,3-Dichloropropene		300	
Bromoform		300	
4-Methyl-2-Pentanone		1,500	
2-Hexanone		300	J
Tetrachloroethene		300	
1,1,2,2-Tetrachloroethane		300	
Toluene		300	
Chlorobenzene		300	
Ethyl Benzene		300	
Styrene		300	
Total Xylenes		300	V

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Lab No. 28636-9

Client ID: T2100119 (soil)

Volatile Organics by Method 8240
Date Extracted: 11-25-92
Date Analyzed: 11-25-92

Compound	Concentration ug/kg		
Chloromethane		500	U
Bromomethane		500	
Vinyl Chloride		500	
Chloroethane		500	↓
Methylene Chloride	510	U	J
Acetone	95		
Carbon Disulfide		250	U
1,1-Dichloroethene		250	
1,1-Dichloroethane		250	
1,2-Dichloroethene (Total)		250	
Chloroform		250	J
1,2-Dichloroethane		250	
2-Butanone		1,250	
1,1,1-Trichloroethane		250	
Carbon Tetrachloride		250	
Vinyl Acetate		1,250	
Bromodichloromethane		250	
1,2-Dichloropropane		250	
Cis-1,3-Dichloropropene		250	
Trichloroethene		250	
Dibromochloromethane		250	
1,1,2-Trichloroethane		250	↓

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Lab No. 28636-9

Client ID: T2100119 (soil)

8240 Continued

Compound Flag	Concentration ug/kg		
Benzene		250 U	
Trans-1,3-Dichloropropene		250	
Bromoform		250	
4-Methyl-2-Pentanone		1,250	
2-Hexanone		250	5
Tetrachloroethene		250	
1,1,2,2-Tetrachloroethane		250	
Toluene		250	
Chlorobenzene		250	
Ethyl Benzene		250	
Styrene		250	
Total Xylenes		250	

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Lab No. 28636-10

Client ID: T2100120 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-25-92

Compound	Concentration ug/l		
Chloromethane	...	20 U	
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	18 U J	20	
Acetone	12		J
Carbon Disulfide		10 U	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

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Lab No. 28636-10

Client ID: T2100120 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10U	
Trans-1,3-Dichloropropene		10	
Bromoform		10	
4-Methyl-2-Pentanone		50	
2-Hexanone		10	J
Tetrachloroethene		10	
1,1,2,2-Tetrachloroethane		10	
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	

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Lab No. 28636-11

Client ID: T2100121 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-25-92

Compound	Concentration ug/l		
Chloromethane		20U	J
Bromomethane		20U	
Vinyl Chloride	18		J
Chloroethane		20U	
Methylene Chloride	16 U J		
Acetone		100U	R
Carbon Disulfide		10	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	J
2-Butanone	110	10	J
1,1,1-Trichloroethane		10	J
Carbon Tetrachloride		10	J
Vinyl Acetate		50	J
Bromodichloromethane		10	J
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene	42	10	
Dibromochloromethane		10U	
1,1,2-Trichloroethane		10U	

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Lab No. 28636-11

Client ID: T2100121 (water)

8240 Continued

Compound	Concentration ug/l		
Benzene			
Trans-1,3-Dichloropropene		10 U	
Bromoform		10	
4-Methyl-2-Pentanone		10	J
2-Hexanone		50	
Tetrachloroethene		10	J
1,1,2,2-Tetrachloroethane	33		
Toluene		10 U	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	J

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Lab No. 28636-12

Client ID: T2100122 (water)

Volatile Organics by Method 8240
 Date Analyzed: 12-1-92

Compound	Concentration ug/l		
Chloromethane		400U	J
Bromomethane		400U	
Vinyl Chloride	1,000		
Chloroethane		400U	
Methylene Chloride	160 U		J
Acetone		2,000U	R
Carbon Disulfide		200	
1,1-Dichloroethene		200	
1,1-Dichloroethane		200	
1,2-Dichloroethene (Total)		200	
Chloroform		200	h
1,2-Dichloroethane		200	
2-Butanone	2,000		
1,1,1-Trichloroethane		200U	h
Carbon Tetrachloride		200	
Vinyl Acetate		1,000	
Bromodichloromethane		200	h
1,2-Dichloropropane		200	
Cis-1,3-Dichloropropene		200	
Trichloroethene	1,100		
Dibromochloromethane		200U	
1,1,2-Trichloroethane		200U	

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Lab No. 28636-12

Client ID: T2100122 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene	6,200	200 U	
Trans-1,3-Dichloropropene		200	
Bromoform		200	J
4-Methyl-2-Pentanone		1,000	
2-Hexanone		200 V	J
Tetrachloroethene			
1,1,2,2-Tetrachloroethane		200 U	
Toluene		200	
Chlorobenzene		200	
Ethyl Benzene		200	
Styrene		200	
Total Xylenes		200 V	J

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Lab No. 28636-13

Client ID: T2100123 (water)

Volatile Organics by Method 8240
 Date Analyzed: 12-1-92

Compound	Concentration ug/l		
Chloromethane		20U	J
Bromomethane		20U	
Vinyl Chloride	66		
Chloroethane		20U	
Methylene Chloride	16 UJ		
Acetone		100U	R
Carbon Disulfide		10	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone	120		
1,1,1-Trichloroethane		10U	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene	42		
Dibromochloromethane		10U	
1,1,2-Trichloroethane		10U	

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Lab No. 28636-13

Client ID: T2100123 (water)

8240 Continued

Compound	Concentration ug/l		
Benzene	5.8	10 U	J
Trans-1,3-Dichloropropene		10	
Bromoform		10	
4-Methyl-2-Pentanone		50	
2-Hexanone		10 V	J
Tetrachloroethene		10	
1,1,2,2-Tetrachloroethane		10 U	J
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10 V	

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Lab No. 28636-14

Client ID: T2100124 (water)

Volatile Organics by Method 8240
 Date Analyzed: 12-1-92

Compound	Concentration ug/l		
Chloromethane		20U	J
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	110 U J	20	
Acetone		100U	R
Carbon Disulfide		10	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	J
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

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Lab No. 28636-14

Client ID: T2100124 (water)

8240 Continued

Compound	Concentration ug/l		
Benzene		10	<div style="display: flex; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg);"> 10 10 10 50 10 10 10 10 10 10 10 10 10 </div> <div style="margin-left: 10px;"> 4 5 mm F28-92 J </div> </div>
Trans-1,3-Dichloropropene		10	
Bromoform		10	
4-Methyl-2-Pentanone		50	
2-Hexanone		10	
Tetrachloroethene		10	
1,1,2,2-Tetrachloroethane		10	
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	

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Lab No. 28636-15

Client ID: T2100115 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-25-92

Compound	Concentration ug/l		
Chloromethane		20 U	J
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	18 U	20	J
Acetone	18		
Carbon Disulfide		10 U	J
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	J
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

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Continued

SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-15

Client ID: T2100115 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10 U	
Trans-1,3-Dichloropropene		10	
Bromoform		10	
4-Methyl-2-Pentanone		10	J
2-Hexanone		50	
Tetrachloroethene		10	J
1,1,2,2-Tetrachloroethane		10	
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	J

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SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-16

Client ID: T2100116 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-25-92

Compound	Concentration ug/l		
Chloromethane		20 U	J
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	20 U	J	
Acetone	14		
Carbon Disulfide		10 U	J
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	J
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

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Continued

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Lab No. 28636-16

Client ID: T2100116 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10	U
Trans-1,3-Dichloropropene		10	
Bromoform		10	J
4-Methyl-2-Pentanone		50	
2-Hexanone		10	J
Tetrachloroethene		10	
1,1,2,2-Tetrachloroethane		10	
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	J

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SOUND ANALYTICAL SERVICES, INC.

Ecology & Environment
 Project: T109210031
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Lab No. 28636-17

Client ID: T2100110 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-25-92

Compound	Concentration ug/l		
Chloromethane		20 U	J
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	18 U		J
Acetone	6.6		J
Carbon Disulfide		10 U	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	J
1,2-Dichloroethane		10	
2-Butanone		50	R
1,1,1-Trichloroethane		10	J
Carbon Tetrachloride		10	J
Vinyl Acetate		50	
Bromodichloromethane		10	J
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

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Lab No. 28636-17

Client ID: T2100110 (water)

8240 Continued

Compound	Concentration ug/l		
Benzene		10	✓
Trans-1,3-Dichloropropene		10	
Bromoform		10	J
4-Methyl-2-Pentanone		50	
2-Hexanone		10	J
Tetrachloroethene		10	
1,1,2,2-Tetrachloroethane		10	
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	✓

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SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-18

Client ID: T2100111 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-25-92

Compound	Concentration ug/l		
Chloromethane		20 U	
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	19 U J	20	
Acetone	9.0		
Carbon Disulfide		10 U	
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	
1,2-Dichloroethane		10	
2-Butanone		10	
1,1,1-Trichloroethane		50	
Carbon Tetrachloride		10	
Vinyl Acetate		10	
Bromodichloromethane		50	
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

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Lab No. 28636-18

Client ID: T2100111 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10	U
Trans-1,3-Dichloropropene		10	44
Bromoform		10	44
4-Methyl-2-Pentanone		10	44
2-Hexanone		50	44
Tetrachloroethene		10	44
1,1,2,2-Tetrachloroethane		10	44
Toluene		10	44
Chlorobenzene		10	44
Ethyl Benzene		10	44
Styrene		10	44
Total Xylenes		10	44

SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-19

Client ID: T2100125 (water)

Volatile Organics by Method 8240
 Date Analyzed: 11-25-92

Compound	Concentration ug/l		
Chloromethane		20	U J
Bromomethane		20	
Vinyl Chloride		20	
Chloroethane		20	
Methylene Chloride	74 U J	20	
Acetone	18		
Carbon Disulfide		10	J
1,1-Dichloroethene		10	
1,1-Dichloroethane		10	
1,2-Dichloroethene (Total)		10	
Chloroform		10	J
1,2-Dichloroethane		10	
2-Butanone		50	
1,1,1-Trichloroethane		10	
Carbon Tetrachloride		10	
Vinyl Acetate		50	
Bromodichloromethane		10	J
1,2-Dichloropropane		10	
Cis-1,3-Dichloropropene		10	
Trichloroethene		10	
Dibromochloromethane		10	
1,1,2-Trichloroethane		10	

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SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-19

Client ID: T2100125 (water)

8240 Continued . . .

Compound	Concentration ug/l		
Benzene		10	✓
Trans-1,3-Dichloropropene		10	
Bromoform		10	J
4-Methyl-2-Pentanone		50	
2-Hexanone		10	J
Tetrachloroethene		10	
1,1,2,2-Tetrachloroethane		10	
Toluene		10	
Chlorobenzene		10	
Ethyl Benzene		10	
Styrene		10	
Total Xylenes		10	✓ J 12693



ecology and environment, inc.

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International Specialists in the Environment

MEMORANDUM

DATE: January 26, 1993

TO: Dawn Hartley, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, TAT-Chemist, E & E, Seattle, WA *MW*

THRU: David Byers, TAT-Chemist, E & E, Seattle, WA *DRB*

SUBJ: Inorganic Data Quality Assurance Review, Northwest Pipe and Casing, Clackamas, Oregon

REF: Project TDD: T10-9210-031 Analytical TDD: T10-9210-058
Project PAN: EOR-0201-SC Analytical PAN: EOR-0202-AB

The data quality assurance review of 12 water and 2 soil samples collected from the Northwest Pipe and Casing site in Clackamas, Oregon, has been completed. Analysis for Priority Pollutant Metals (EPA 6000 and 7000 series methods) was performed by Sound Analytical Services, Tacoma, Washington.

The 14 samples were numbered:

T2100104	T2100105	T2100106	T2100110	T2100111
T2100112	T2100113	T2100114	T2100115	T2100116
T2100117	T2100118(soil)	T2100119(soil)	T2100120	

Data Qualifications:

I Holding Time: Acceptable.

Samples T2100104, T2100105, and T2100106 were collected 11-18-92. Samples T2100110 through sample T2100117 were collected on 11-19-92. Samples T2100118, T2100119, and T2100120 were collected 11-20-92. All analyses were performed on or before 12-08-92, therefore meeting QC criteria of less than 28 days between sampling and mercury analysis and less than 6 months between sampling and analysis for all other metals.

II Calibration

A. Initial Calibration and Calibration Verification: Acceptable.

All mercury results were within the control limits of 80 to 120 percent of the true values. All ICP results were within the 90 to 110 percent control limits.

B. Spike Sample Analysis: Satisfactory.

All Matrix Spike recoveries for the elements analyzed were within QC limits, except:

<u>Sample</u>	<u>Element</u>	<u>Recovery</u>	<u>QC Limits</u>
T2100119S	Thallium	71.5 %	75% - 125%

Positive results and sample quantitation limits for thallium in the soil samples were flagged as estimated quantities (J).

C. Serial Dilution Analysis: Satisfactory.

All Serial Dilution results for the elements analyzed were within QC limits, except:

<u>Sample</u>	<u>Element</u>	<u>Difference</u>	<u>QC Limits</u>
T2100119L	Arsenic	273.9 %	< 10 %
	Cadmium	37.4 %	< 10 %
	Chromium	28.9 %	< 10 %
	Copper	17.9 %	< 10 %
	Lead	98.6 %	< 10 %
	Zinc	25.5 %	< 10 %

Positive arsenic, cadmium, chromium, copper, lead, and zinc results were flagged as estimated quantities (J) in the soil samples.

VII Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses".

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.

U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100104

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER

Lab Sample ID: 28636-4_

Level (low/med): LOW_

Date Received: 12/09/92

% Solids: _____ 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	60.0	U		P_
7440-38-2	Arsenic_	14.7			F_
7440-39-3	Barium_				NR
7440-41-7	Beryllium_	5.0	U		P_
7440-43-9	Cadmium_	5.0			P_
7440-70-2	Calcium_				NR
7440-47-3	Chromium_	76.4			P_
7440-48-4	Cobalt_				NR
7440-50-8	Copper_	141			P_
7439-89-6	Iron_				NR
7439-92-1	Lead_	23.4			F_
7439-95-4	Magnesium_				NR
7439-96-5	Manganese_				NR
7439-97-6	Mercury_	0.26			AV
7440-02-0	Nickel_	60.6			P_
7440-09-7	Potassium_				NR
7782-49-2	Selenium_	5.0	U		F_
7440-22-4	Silver_	10.0	U		P_
7440-23-5	Sodium_				NR
7440-28-0	Thallium_	10.0	U		F_
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_	352			P_
5955-70-0	Cyanide_				NR

Color Before: _____

Clarity Before: _____

Texture: _____

Color After: _____

Clarity After: _____

Artifacts: _____

Comments:

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EPA SAMPLE NO.

100105

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER Lab Sample ID: 28636-5_

Level (low/med): LOW_ Date Received: 12/09/92

% Solids: ____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	81.3			P_
7440-38-2	Arsenic_	10.0	U		F_
7440-39-3	Barium_				NR
7440-41-7	Beryllium_	5.0	U		P_
7440-43-9	Cadmium_	5.0	U	J	P_
7440-70-2	Calcium_				NR
7440-47-3	Chromium_	29.4			P_
7440-48-4	Cobalt_				NR
7440-50-8	Copper_	46.4			P_
7439-89-6	Iron_				NR
7439-92-1	Lead_	9.4			F_
7439-95-4	Magnesium_				NR
7439-96-5	Manganese_				NR
7439-97-6	Mercury_	0.20	U		AV
7440-02-0	Nickel_	40.0	U		P_
7440-09-7	Potassium_				NR
7782-49-2	Selenium_	5.0	U		F_
7440-22-4	Silver_	10.0	U		P_
7440-23-5	Sodium_				NR
7440-28-0	Thallium_	10.0	U		F_
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_	277			P_
5955-70-0	Cyanide_				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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EPA SAMPLE NO.

100106

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER Lab Sample ID: 28636-6_

Level (low/med): LOW_ Date Received: 12/09/92

% Solids: _____ 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum		-		NR
7440-36-0	Antimony	60.0	U		P_
7440-38-2	Arsenic	10.0	U		F_
7440-39-3	Barium		-		NR
7440-41-7	Beryllium	5.0	U		P_
7440-43-9	Cadmium	5.0	U	J	P_
7440-70-2	Calcium		-		NR
7440-47-3	Chromium	10.0	U		P_
7440-48-4	Cobalt		-		NR
7440-50-8	Copper	25.0	U		P_
7439-89-6	Iron		-		NR
7439-92-1	Lead	3.0	U		F_
7439-95-4	Magnesium		-		NR
7439-96-5	Manganese		-		NR
7439-97-6	Mercury	0.20	U		AV
7440-02-0	Nickel	40.0	U		P_
7440-09-7	Potassium		-		NR
7782-49-2	Selenium	5.0	U		F_
7440-22-4	Silver	10.0	U		P_
7440-23-5	Sodium		-		NR
7440-28-0	Thallium	10.0	U		F_
7440-62-2	Vanadium		-		NR
7440-66-6	Zinc	21.3	-		P_
5955-70-0	Cyanide		-		NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100110

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER

Lab Sample ID: 28636-17_

Level (low/med): LOW_

Date Received: 12/09/92

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	60.0	U		P_
7440-38-2	Arsenic	10.0	U		F_
7440-39-3	Barium				NR
7440-41-7	Beryllium	5.0	U		P_
7440-43-9	Cadmium	5.0	U	J	P_
7440-70-2	Calcium				NR
7440-47-3	Chromium	69.4			P_
7440-48-4	Cobalt				NR
7440-50-8	Copper	25.0	U		P_
7439-89-6	Iron				NR
7439-92-1	Lead	3.1			F_
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		AV
7440-02-0	Nickel	40.0	U		P_
7440-09-7	Potassium				NR
7782-49-2	Selenium	5.0	U		F_
7440-22-4	Silver	10.0	U		P_
7440-23-5	Sodium				NR
7440-28-0	Thallium	10.0	U		F_
7440-62-2	Vanadium				NR
7440-66-6	Zinc	20.0	U		P_
5955-70-0	Cyanide				NR

Color Before: _____

Clarity Before: _____

Texture: _____

Color After: _____

Clarity After: _____

Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100111

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER Lab Sample ID: 28636-18_

Level (low/med): LOW_ Date Received: 12/09/92

% Solids: _____ 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	60.0	U		P_
7440-38-2	Arsenic	10.0	U		F_
7440-39-3	Barium				NR
7440-41-7	Beryllium	5.0	U		P_
7440-43-9	Cadmium	5.0	U		P_
7440-70-2	Calcium				NR
7440-47-3	Chromium	10.0	U		P_
7440-48-4	Cobalt				NR
7440-50-8	Copper	25.0	U		P_
7439-89-6	Iron				NR
7439-92-1	Lead	3.0	U		F_
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		AV
7440-02-0	Nickel	40.0	U		P_
7440-09-7	Potassium				NR
7782-49-2	Selenium	5.0	U		F_
7440-22-4	Silver	10.0	U		P_
7440-23-5	Sodium				NR
7440-28-0	Thallium	10.0	U		F_
7440-62-2	Vanadium				NR
7440-66-6	Zinc	20.0	U		P_
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100112

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER

Lab Sample ID: 28636-2_

Level (low/med): LOW_

Date Received: 12/09/92

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_		-		NR
7440-36-0	Antimony_	60.0	U		P_
7440-38-2	Arsenic_	11.1	-		F_
7440-39-3	Barium_		-		NR
7440-41-7	Beryllium_	5.0	U		P_
7440-43-9	Cadmium_	5.0	U	J	P_
7440-70-2	Calcium_		-		NR
7440-47-3	Chromium_	41.0	-		P_
7440-48-4	Cobalt_		-		NR
7440-50-8	Copper_	71.8	-		P_
7439-89-6	Iron_		-		NR
7439-92-1	Lead_	23.2	-		F_
7439-95-4	Magnesium_		-		NR
7439-96-5	Manganese_		-		NR
7439-97-6	Mercury_	0.20	U		AV
7440-02-0	Nickel_	44.8	-		P_
7440-09-7	Potassium_		-		NR
7782-49-2	Selenium_	5.0	U		F_
7440-22-4	Silver_	10.0	U		P_
7440-23-5	Sodium_		-		NR
7440-28-0	Thallium_	10.0	U		F_
7440-62-2	Vanadium_		-		NR
7440-66-6	Zinc_	110	-		P_
5955-70-0	Cyanide_		-		NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100113

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER Lab Sample ID: 28636-3_

Level (low/med): LOW_ Date Received: 12/09/92

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum		—		NR
7440-36-0	Antimony	60.0	U		P_
7440-38-2	Arsenic	10.0	U		F_
7440-39-3	Barium		—		NR
7440-41-7	Beryllium	5.0	U		P_
7440-43-9	Cadmium	5.0	U	P	P_
7440-70-2	Calcium		—		NR
7440-47-3	Chromium	10.0	U		P_
7440-48-4	Cobalt		—		NR
7440-50-8	Copper	25.0	U		P_
7439-89-6	Iron		—		NR
7439-92-1	Lead	3.0	U		F_
7439-95-4	Magnesium		—		NR
7439-96-5	Manganese		—		NR
7439-97-6	Mercury	0.20	U		AV
7440-02-0	Nickel	40.0	U		P_
7440-09-7	Potassium		—		NR
7782-49-2	Selenium	5.0	U		F_
7440-22-4	Silver	10.0	U		P_
7440-23-5	Sodium		—		NR
7440-28-0	Thallium	10.0	U		F_
7440-62-2	Vanadium		—		NR
7440-66-6	Zinc	20.0	U		P_
5955-70-0	Cyanide		—		NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100114

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER

Lab Sample ID: 28636-1_

Level (low/med): LOW_

Date Received: 12/09/92

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	60.0	U		P_
7440-38-2	Arsenic_	10.0	U		F_
7440-39-3	Barium_				NR
7440-41-7	Beryllium_	5.0	U		P_
7440-43-9	Cadmium_	5.0	U	J	P_
7440-70-2	Calcium_				NR
7440-47-3	Chromium_	80.1			P_
7440-48-4	Cobalt_				NR
7440-50-8	Copper_	25.0	U		P_
7439-89-6	Iron_				NR
7439-92-1	Lead_	3.0	U		F_
7439-95-4	Magnesium_				NR
7439-96-5	Manganese_				NR
7439-97-6	Mercury_	0.20	U		AV
7440-02-0	Nickel_	72.6			P_
7440-09-7	Potassium_				NR
7782-49-2	Selenium_	5.0	U		F_
7440-22-4	Silver_	10.0	U		P_
7440-23-5	Sodium_				NR
7440-28-0	Thallium_	10.0	U		F_
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_	106			P_
5955-70-0	Cyanide_				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

100114-24-93

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100115

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_____

Matrix (soil/water): WATER

Lab Sample ID: 28636-15_

Level (low/med): LOW_

Date Received: 12/09/92

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	60.0	U		P_
7440-38-2	Arsenic	10.0	U		F_
7440-39-3	Barium				NR
7440-41-7	Beryllium	5.0	U		P_
7440-43-9	Cadmium	5.0	U	J	P_
7440-70-2	Calcium				NR
7440-47-3	Chromium	10.0	U		P_
7440-48-4	Cobalt				NR
7440-50-8	Copper	29.0			P_
7439-89-6	Iron				NR
7439-92-1	Lead	5.8			F_
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		AV
7440-02-0	Nickel	40.0	U		P_
7440-09-7	Potassium				NR
7782-49-2	Selenium	5.0	U		F_
7440-22-4	Silver	10.0	U		P_
7440-23-5	Sodium				NR
7440-28-0	Thallium	10.0	U		F_
7440-62-2	Vanadium				NR
7440-66-6	Zinc	43.2			P_
5955-70-0	Cyanide				NR

Color Before: _____

Clarity Before: _____

Texture: _____

Color After: _____

Clarity After: _____

Artifacts: _____

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100116

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER

Lab Sample ID: 28636-16_

Level (low/med): LOW_

Date Received: 12/09/92

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	60.0	U		P_
7440-38-2	Arsenic	10.0	U		F_
7440-39-3	Barium				NR
7440-41-7	Beryllium	5.0	U		P_
7440-43-9	Cadmium	5.0	U	J	P_
7440-70-2	Calcium				NR
7440-47-3	Chromium	11.6			P_
7440-48-4	Cobalt				NR
7440-50-8	Copper	25.0	U		P_
7439-89-6	Iron				NR
7439-92-1	Lead	5.3			F_
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.20	U		AV
7440-02-0	Nickel	40.0	U		P_
7440-09-7	Potassium				NR
7782-49-2	Selenium	5.0	U		F_
7440-22-4	Silver	10.0	U		P_
7440-23-5	Sodium				NR
7440-28-0	Thallium	10.0	U		F_
7440-62-2	Vanadium				NR
7440-66-6	Zinc	22.9			P_
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100117

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER

Lab Sample ID: 28636-7_

Level (low/med): LOW_

Date Received: 12/09/92

% Solids: _____ 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	60.0	U		P_
7440-38-2	Arsenic_	10.0	U		F_
7440-39-3	Barium_				NR
7440-41-7	Beryllium_	5.0	U		P_
7440-43-9	Cadmium_	5.0	U	J	P_
7440-70-2	Calcium_				NR
7440-47-3	Chromium_	980			P_
7440-48-4	Cobalt_				NR
7440-50-8	Copper_	46.6			P_
7439-89-6	Iron_				NR
7439-92-1	Lead_	4.7			F_
7439-95-4	Magnesium_				NR
7439-96-5	Manganese_				NR
7439-97-6	Mercury_	0.20	U		AV
7440-02-0	Nickel_	597			P_
7440-09-7	Potassium_				NR
7782-49-2	Selenium_	5.0	U		F_
7440-22-4	Silver_	10.0	U		P_
7440-23-5	Sodium_				NR
7440-28-0	Thallium_	10.0	U		F_
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_	25.9			P_
5955-70-0	Cyanide_				NR

Color Before: _____

Clarity Before: _____

Texture: _____

Color After: _____

Clarity After: _____

Artifacts: _____

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100118

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_____

Matrix (soil/water): SOIL_ Lab Sample ID: 28636-8_____

Level (low/med): LOW_ Date Received: 12/09/92

% Solids: _68.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_				NR
7440-36-0	Antimony_	2.1	U		P_
7440-38-2	Arsenic_	3.9	J		P_
7440-39-3	Barium_				NR
7440-41-7	Beryllium_	0.18	U		P_
7440-43-9	Cadmium_	1.7	J		P_
7440-70-2	Calcium_				NR
7440-47-3	Chromium_	12.3	J		P_
7440-48-4	Cobalt_				NR
7440-50-8	Copper_	19.4	J		P_
7439-89-6	Iron_				NR
7439-92-1	Lead_	2.8	J		P_
7439-95-4	Magnesium_				NR
7439-96-5	Manganese_				NR
7439-97-6	Mercury_	0.12	U		AV
7440-02-0	Nickel_	18.8			P_
7440-09-7	Potassium_				NR
7782-49-2	Selenium_	3.5	U		P_
7440-22-4	Silver_	0.72			P_
7440-23-5	Sodium_				NR
7440-28-0	Thallium_	5.3	U	J	P_
7440-62-2	Vanadium_				NR
7440-66-6	Zinc_	33.8	J		P_
5955-70-0	Cyanide_				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100119

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): SOIL_ Lab Sample ID: 28636-9_

Level (low/med): LOW_ Date Received: 12/09/92

% Solids: _75.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_		-		NR
7440-36-0	Antimony_	1.7	U		P_
7440-38-2	Arsenic_	3.8	J		P_
7440-39-3	Barium_		-		NR
7440-41-7	Beryllium	0.14	U		P_
7440-43-9	Cadmium_	2.0	J		P_
7440-70-2	Calcium_		-		NR
7440-47-3	Chromium_	13.9	J		P_
7440-48-4	Cobalt_		-		NR
7440-50-8	Copper_	19.3	J		P_
7439-89-6	Iron_		-		NR
7439-92-1	Lead_	4.7	J		P_
7439-95-4	Magnesium		-		NR
7439-96-5	Manganese		-		NR
7439-97-6	Mercury_	0.13	U		AV
7440-02-0	Nickel_	13.5	-		P_
7440-09-7	Potassium		-		NR
7782-49-2	Selenium_	2.9	U		P_
7440-22-4	Silver_	0.66	-		P_
7440-23-5	Sodium_		-		NR
7440-28-0	Thallium_	4.3	U	J	P_
7440-62-2	Vanadium_		-		NR
7440-66-6	Zinc_	35.9	J		P_
5955-70-0	Cyanide_		-		NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100120

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28636_ SDG No.: E&E_

Matrix (soil/water): WATER

Lab Sample ID: 28636-10_

Level (low/med): LOW_

Date Received: 12/09/92

% Solids: ____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum_		-		NR
7440-36-0	Antimony_	60.0	U		P_
7440-38-2	Arsenic_	10.0	U		F_
7440-39-3	Barium_		-		NR
7440-41-7	Beryllium_	5.0	U		P_
7440-43-9	Cadmium_	5.0	U	J	P_
7440-70-2	Calcium_		-		NR
7440-47-3	Chromium_	10.0	U		P_
7440-48-4	Cobalt_		-		NR
7440-50-8	Copper_	25.0	U		P_
7439-89-6	Iron_		-		NR
7439-92-1	Lead_	3.0	U		F_
7439-95-4	Magnesium_		-		NR
7439-96-5	Manganese_		-		NR
7439-97-6	Mercury_	0.20	U		AV
7440-02-0	Nickel_	40.0	U		P_
7440-09-7	Potassium_		-		NR
7782-49-2	Selenium_	5.0	U		F_
7440-22-4	Silver_	10.0	U		P_
7440-23-5	Sodium_		-		NR
7440-28-0	Thallium_	10.0	U		F_
7440-62-2	Vanadium_		-		NR
7440-66-6	Zinc_	20.0	U		P_
5955-70-0	Cyanide_		-		NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments: _____

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MEMORANDUM

DATE: January 26, 1993

TO: Dawn Hartley, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, TAT-Chemist, E & E, Seattle, WA *MW*

THRU: David Byers, TAT-Chemist, E & E, Seattle, WA *DB*

SUBJ: Chlorinated Pesticide/PCB Data Quality Assurance Review,
Northwest Pipe and Casing, Clackamas, Oregon

REF: Project TDD: T10-9210-031 Analytical TDD: T10-9210-058
Project PAN: EOR-0201-SC Analytical PAN: EOR-0201-AB

The data quality assurance review of one soil sample collected from the Northwest Pipe and Casing site in Clackamas, Oregon, has been completed. Analysis for Chlorinated Pesticides/Polychlorinated Biphenyls (EPA method 8080) was performed by Sound Analytical Services, Tacoma, Washington.

The sample was numbered: T2100100

Data Qualifications:

I Sample Holding Time: Acceptable.

Sample T2100100 was collected 10-28-92, extracted on 11-10-92, and analyzed on 11-13-92. The sample was within QC holding time criteria of 14 days between collection and extraction and 40 days between extraction and analysis.

II Instrument Performance: Acceptable.

Peak resolution for all compounds was acceptable. The surrogate retention time shift was within QC limits.

III Calibration

A. Initial Calibration: Satisfactory.

A six-point initial calibration was performed for each pesticide of interest, with all % Relative Standard Deviation (%RSDs) within QC limits of < 20 %, except:

<u>Date</u>	<u>Column</u>	<u>Compound</u>	<u>% RSD</u>	<u>QC Limits</u>
11-12-92	DB-5	delta-BHC	23 %	< 20 %
11-12-92	DB-608	alpha-BHC	27 %	< 20 %
11-12-92	DB-608	delta-BHC	27 %	< 20 %
11-12-92	DB-608	Heptachlor	37 %	< 20 %
11-12-92	DB-608	4,4'-DDT	22 %	< 20 %

Positive results and sample quantitation limits for the initial calibration QC outliers were flagged as estimated quantities (J).

A 1-point calibration for each PCB of interest was performed.

B. Continuing Calibration: Not Performed.

A continuing calibration was not necessary as all analyses were performed within 12 hours of the initial calibration, except the method blank. No action was taken based on method blank analysis after the 12 hour time limit as no compounds were detected in the sample.

IV Method Blank: Acceptable.

No contaminants were detected in any method blanks.

V Surrogate Recoveries: Acceptable.

All recoveries for decachlorobiphenyl and tetrachloro-meta-xylene were within QC criteria.

VI Matrix Spike/Matrix Spike Duplicate: Satisfactory.

All matrix spike/matrix spike duplicate percent recoveries were within QC limits, except:

<u>Sample</u>	<u>Compound</u>	<u>Recovery</u>	<u>QC Limits</u>
T2100100S	4,4'-DDT	141 %	23 % - 134 %

No action was taken based on the MS/MSD QC outlier.

VII Field Duplicates: Not Applicable.

VIII Compound Identification: Acceptable.

Compound identification, including dual column confirmation, was acceptable.

IX Compound Quantitation and Reported Detection Limits: Acceptable.

Compound quantitation was acceptable.

X Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Directive "National Functional Guidelines For Organic Data Review" (June 1991).

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

- J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SOUND ANALYTICAL SERVICES, INC.

Ecology & Environment
Project: T109210031
Lab No. 28231
Page 3 of 5
December 31, 1992

Lab No. 28231-1

Client ID: T2100100

Organochlorine Pesticides and PCB's Per EPA Method 8080
Date Extracted: 11-10-92
Date Analyzed: 11-13-92

<u>Compound</u>	<u>Concentration, mg/kg</u>	
Aldrin	0.001	U
a-BHC	0.001	J
b-BHC	0.001	
g-BHC	0.001	
y-BHC (Lindane)	0.001	J
Chlordane (technical)	0.01	
4,4'-DDD	0.001	
4,4'-DDE	0.001	
4,4'-DDT	0.001	J
Dieldrin	0.001	
Endosulfan I	0.001	
Endosulfan II	0.001	
Endosulfan sulfate	0.001	
Endrin	0.001	
Endrin aldehyde	0.001	
Heptachlor	0.001	J
Heptachlor epoxide	0.001	
Endrin Ketone	0.001	
Methoxychlor	0.002	
Toxaphene	0.01	
Aroclor 1016	0.001	
Aroclor 1221	0.001	
Aroclor 1232	0.001	
Aroclor 1242	0.001	
Aroclor 1248	0.001	
Aroclor 1254	0.001	
Aroclor 1260	0.001	
Aroclor 1262	0.001	
Aroclor 1268	0.001	↓

MW 1-26-93



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International Specialists in the Environment

MEMORANDUM

DATE: January 26, 1993

TO: Dawn Hartley, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, TAT-Chemist, E & E, Seattle, WA *mw*

THRU: David Byers, TAT-Chemist, E & E, Seattle, WA *DRB*

SUBJ: Organic Data Quality Assurance Review, Northwest Pipe and Casing, Clackamas, Oregon

REF: Project TDD: T10-9210-031 Analytical TDD: T10-9210-058
Project PAN: EOR-0201-SC Analytical PAN: EOR-0202-AB

The data quality assurance review of 2 soil samples collected from the Northwest Pipe and Casing site in Clackamas, Oregon, has been completed. Analysis for Semivolatile Organic Compounds (EPA method 8270) was performed by Sound Analytical Services, Tacoma, Washington.

The 2 samples were numbered: T2100100 T2100101

Data Qualifications:

I Holding Time: Acceptable.

Sample T2100100 was collected 10-28-92. Sample T2100101 was collected on 11-03-92. All samples were extracted on 11-11-92. All samples were analyzed on 11-14-92. All samples were analyzed within QC criteria of 14 days from collection to extraction and 40 days from extraction to analysis.

II GC/MS Tuning: Acceptable.

All tuning check compound mass abundances and ratios were within contract-required limits for semivolatile analysis.

III Calibration

A. Initial Calibration: Satisfactory.

All System Performance Check Compounds (SPCCs) were within contract-required limits for the initial calibration with average Relative Response Factors (RRFs) above 0.05 for semivolatiles. All Calibration Check Compounds (CCCs) and non-CCCs were within contract-required limits for the initial calibration with % Relative Standard Deviations (RSDs) below 30 percent, except:

<u>Date</u>	<u>Compound</u>	<u>%RSDs</u>	<u>Associated Samples</u>
11-13-92	Benzoic Acid	36.8	All
	2,4-Dinitrophenol	37.2	All

No action was taken by the data reviewer as benzoic acid and 2,4-dinitrophenol were not detected in any sample.

B. Continuing Calibration: Satisfactory.

All CCCs were at or below the contract-required Relative Percent Difference (RPD) limits of 25 for the semivolatile continuing calibration. All compounds were at or above the contract-required Relative Response Factor (RRF(50)) QC criteria. All non-CCCs had percent difference (%D) values for the continuing calibration of less than or equal to 25 percent, except:

<u>Date</u>	<u>Time</u>	<u>Compound</u>	<u>%D</u>	<u>QC Limits</u>	<u>Assoc. Samples</u>
11-14-92	0831	Benzoic acid	48.3	< 25	All
		Pentachlorophenol	28.0	< 25	
		4-Nitrophenol	25.5	< 25	

Positive results and sample quantitation limits for the continuing calibration QC outliers were flagged as estimated quantities (J) in the associated samples.

IV Method Blank: Satisfactory.

The following compound was detected in a method blank:

<u>Blank</u>	<u>Compound</u>	<u>Concentration ug/Kg</u>	<u>Associated Samples</u>
M. Blank	Di-n-butylphthalate	190	All

Results for the compound detected in the blanks were flagged as not detected (U) in the associated samples if the amount detected in the samples was less than 5 times the amount detected in the blank (10 times for common contaminants).

V Surrogate Recovery: Satisfactory.

All surrogate results met QC criteria, except:

<u>Sample</u>	<u>Surrogate</u>	<u>Recovery</u>	<u>QC Limits</u>
T2100101	Nitrobenzene	17 %	23 % - 110 %
	2-Fluorobiphenyl	20 %	30 % - 115 %

Base/neutral positive results and sample quantitation limits for sample T2100101 were flagged as estimated quantities (J).

VI Matrix Spike/Matrix Spike Duplicates: Acceptable.

All matrix spike/matrix spike duplicate (MS/MSD) results were within QC limits. Sample T2100103, analyzed 12-14-92 and reported in a different data validation package, was used as the MS/MSD sample for this data group.

VII Internal Standards: Acceptable.

All internal standard results were within QC limits.

VIII Field Duplicates: Not Applicable.

IX Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Directive "National Functional Guideline for Organic Data Review" (June 1991).

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

- J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

231-1

Lab Name: Sound Analytical Services Contract: T109210031

Lab Code: - Case No.: - SAS No.: - SDG No.: 28231

Matrix: (soil/water) SOIL Lab Sample ID: 28231-1

Sample wt/vol: 30.1 (g/ml) G Lab File ID: S6777

Level: (low/med) LOW Date Received: 11/04/92

% Moisture: 15 decanted: (Y/N) N Date Extracted: 11/11/92

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 11/14/92

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 0.0

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) UG/KG Q

108-95-2-----	Phenol	390.	U
111-44-4-----	Bis(2-chloroethyl) ether	390.	U
95-57-8-----	2-Chlorophenol	390.	U
541-73-1-----	1,3-Dichlorobenzene	390.	U
106-46-7-----	1,4-Dichlorobenzene	390.	U
100-51-6-----	Benzyl alcohol	780.	U
95-50-1-----	1,2-Dichlorobenzene	390.	U
95-48-7-----	2-Methylphenol	390.	U
108-60-1-----	2,2'-oxybis(1-Chloropropane)	390.	U
106-44-5-----	4-Methylphenol	390.	U
621-64-7-----	N-Nitroso-di-n-propylamine	390.	U
67-72-1-----	Hexachloroethane	390.	U
98-95-3-----	Nitrobenzene	390.	U
78-59-1-----	Isophorone	390.	U
88-75-5-----	2-Nitrophenol	390.	U
105-67-9-----	2,4-Dimethylphenol	390.	U
65-85-0-----	Benzoic acid	2000.	U
111-91-1-----	bis(2-Chloroethoxy) methane	390.	U
120-83-2-----	2,4-Dichlorophenol	390.	U
120-82-1-----	1,2,4-Trichlorobenzene	390.	U
91-20-3-----	Naphthalene	390.	U
106-47-8-----	4-Chloroaniline	780.	U
87-68-3-----	Hexachlorobutadiene	390.	U
59-50-7-----	4-Chloro-3-methylphenol	780.	U
91-57-6-----	2-Methylnaphthalene	390.	U
77-47-4-----	Hexachlorocyclopentadiene	390.	U
88-06-2-----	2,4,6-Trichlorophenol	390.	U
95-95-4-----	2,4,5-Trichlorophenol	390.	U
91-58-7-----	2-Chloronaphthalene	390.	U
88-74-4-----	2-Nitroaniline	2000.	U
131-11-3-----	Dimethylphthalate	390.	U
208-96-8-----	Acenaphthylene	390.	U
606-20-2-----	2,6-Dinitrotoluene	390.	U

mw 1-26-93

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

231-1

Lab Name: Sound Analytical Services Contract: T109210031

Lab Code: - Case No.: - SAS No.: - SDG No.: 28231

Matrix: (soil/water) SOIL Lab Sample ID: 28231-1

Sample wt/vol: 30.1 (g/ml) G Lab File ID: S6777

Level: (low/med) LOW Date Received: 11/04/92

% Moisture: 15 decanted: (Y/N) N Date Extracted: 11/11/92

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 11/14/92

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 0.0

CAS NO. COMPOUND CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG Q

99-09-2-----3-Nitroaniline	2000.	U
83-32-9-----Acenaphthene	390.	U
51-28-5-----2,4-Dinitrophenol	2000.	U
100-02-7-----4-Nitrophenol	2000.	UJ
132-64-9-----Dibenzofuran	390.	U
121-14-2-----2,4-Dinitrotoluene	390.	U
84-66-2-----Diethylphthalate	390.	U
7005-72-3-----4-Chlorophenyl-phenylether	390.	U
86-73-7-----Fluorene	390.	U
100-01-6-----4-Nitroaniline	2000.	U
534-52-1-----4,6-Dinitro-2-methylphenol	2000.	U
86-30-6-----N-Nitrosodiphenylamine(1)	390.	U
101-55-3-----4-Bromophenyl-phenylether	390.	U
118-74-1-----Hexachlorobenzene	390.	U
87-86-5-----Pentachlorophenol	2000.	UJ
85-01-8-----Phenanthrene	390.	U
120-12-7-----Anthracene	390.	U
84-74-2-----Di-n-butylphthalate	130.	UJ
206-44-0-----Fluoranthene	390.	U
129-00-0-----Pyrene	390.	U
85-68-7-----Butylbenzylphthalate	390.	U
91-94-1-----3,3'-Dichlorobenzidine	780.	U
56-55-3-----Benzo(a)anthracene	390.	U
218-01-9-----Chrysene	390.	U
117-81-7-----bis(2-Ethylhexyl)phthalate	160.	J
117-84-0-----Di-n-octylphthalate	390.	U
205-99-2-----Benzo(b)fluoranthene	390.	U
207-08-9-----Benzo(k)fluoranthene	390.	U
50-32-8-----Benzo(a)pyrene	390.	U
193-39-5-----Indeno(1,2,3-cd)pyrene	390.	U
53-70-3-----Dibenz(a,h)anthracene	390.	U
191-24-2-----Benzo(g,h,i)perylene	390.	U

(1) - Cannot be separated from Diphenylamine

MR 1-26-93

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

231-2

Lab Name: Sound Analytical Services Contract: T109210031

Lab Code: - Case No.: - SAS No.: - SDG No.: 28231

Matrix: (soil/water) SOIL Lab Sample ID: 28231-2

Sample wt/vol: 30.3 (g/ml) G Lab File ID: S6779

Level: (low/med) LOW Date Received: 11/04/92

% Moisture: 28 decanted: (Y/N) N Date Extracted: 11/11/92

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 11/14/92

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 0.0

CONCENTRATION UNITS:

CAS NO. COMPOUND (ug/L or ug/Kg) UG/KG Q

108-95-2-----	Phenol	460.	U
111-44-4-----	Bis(2-chloroethyl) ether	460.	UJ
95-57-8-----	2-Chlorophenol	460.	U
541-73-1-----	1,3-Dichlorobenzene	460.	UJ
106-46-7-----	1,4-Dichlorobenzene	460.	UJ
100-51-6-----	Benzyl alcohol	920.	U
95-50-1-----	1,2-Dichlorobenzene	460.	UJ
95-48-7-----	2-Methylphenol	460.	U
108-60-1-----	2,2'-oxybis(1-Chloropropane)	460.	UJ
106-44-5-----	4-Methylphenol	460.	U
621-64-7-----	N-Nitroso-di-n-propylamine	460.	UJ
67-72-1-----	Hexachloroethane	460.	UJ
98-95-3-----	Nitrobenzene	460.	UJ
78-59-1-----	Isophorone	460.	UJ
88-75-5-----	2-Nitrophenol	460.	U
105-67-9-----	2,4-Dimethylphenol	460.	U
65-85-0-----	Benzoic acid	2300.	UJ
111-91-1-----	bis(2-Chloroethoxy)methane	460.	UJ
120-83-2-----	2,4-Dichlorophenol	460.	U
120-82-1-----	1,2,4-Trichlorobenzene	460.	UJ
91-20-3-----	Naphthalene	460.	UJ
106-47-8-----	4-Chloroaniline	920.	UJ
87-68-3-----	Hexachlorobutadiene	460.	UJ
59-50-7-----	4-Chloro-3-methylphenol	920.	U
91-57-6-----	2-Methylnaphthalene	460.	UJ
77-47-4-----	Hexachlorocyclopentadiene	460.	UJ
88-06-2-----	2,4,6-Trichlorophenol	460.	U
95-95-4-----	2,4,5-Trichlorophenol	460.	U
91-58-7-----	2-Chloronaphthalene	460.	UJ
88-74-4-----	2-Nitroaniline	2300.	U
131-11-3-----	Dimethylphthalate	460.	U
208-96-8-----	Acenaphthylene	460.	U
606-20-2-----	2,6-Dinitrotoluene	460.	UV

MW
1-26-93

1C
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

231-2

Lab Name: Sound Analytical Services Contract: T109210031

Lab Code: - Case No.: - SAS No.: - SDG No.: 28231

Matrix: (soil/water) SOIL Lab Sample ID: 28231-2

Sample wt/vol: 30.3 (g/ml) G Lab File ID: S6779

Level: (low/med) LOW Date Received: 11/04/92

% Moisture: 28 decanted: (Y/N) N Date Extracted: 11/11/92

Concentrated Extract Volume: 1000.0 (uL) Date Analyzed: 11/14/92

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 0.0

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.

COMPOUND

Q

99-09-2-----	3-Nitroaniline	2300.	UJ
83-32-9-----	Acenaphthene	460.	UJ
51-28-5-----	2,4-Dinitrophenol	2300.	U
100-02-7-----	4-Nitrophenol	2300.	UJ
132-64-9-----	Dibenzofuran	460.	UJ
121-14-2-----	2,4-Dinitrotoluene	460.	U
84-66-2-----	Diethylphthalate	460.	U
7005-72-3-----	4-Chlorophenyl-phenylether	460.	U
86-73-7-----	Fluorene	460.	U
100-01-6-----	4-Nitroaniline	2300.	UV
534-52-1-----	4,6-Dinitro-2-methylphenol	2300.	U
86-30-6-----	N-Nitrosodiphenylamine(1)	460.	UJ
101-55-3-----	4-Bromophenyl-phenylether	460.	UJ
118-74-1-----	Hexachlorobenzene	460.	UJ
87-86-5-----	Pentachlorophenol	2300.	UJ
85-01-8-----	Phenanthrene	460.	UJ
120-12-7-----	Anthracene	460.	UJ
84-74-2-----	Di-n-butylphthalate	440.	UJ
206-44-0-----	Fluoranthene	460.	UJ
129-00-0-----	Pyrene	460.	U
85-68-7-----	Butylbenzylphthalate	460.	U
91-94-1-----	3,3'-Dichlorobenzidine	920.	U
56-55-3-----	Benzo(a)anthracene	460.	U
218-01-9-----	Chrysene	460.	UV
117-81-7-----	bis(2-Ethylhexyl)phthalate	640.	J
117-84-0-----	Di-n-octylphthalate	460.	UJ
205-99-2-----	Benzo(b)fluoranthene	460.	U
207-08-9-----	Benzo(k)fluoranthene	460.	U
50-32-8-----	Benzo(a)pyrene	460.	U
193-39-5-----	Indeno(1,2,3-cd)pyrene	460.	U
53-70-3-----	Dibenz(a,h)anthracene	460.	U
191-24-2-----	Benzo(g,h,i)perylene	460.	UV

(1) - Cannot be separated from Diphenylamine

mir 1-26-93



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MEMORANDUM

DATE: January 19, 1993

TO: Dawn Hartley, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, TAT-Chemist, E & E, Seattle, WA *MW*

THRU: David Byers, TAT-Chemist, E & E, Seattle, WA *DRB*

SUBJ: Inorganic Data Quality Assurance Review, Northwest Pipe and Casing, Clackamas, Oregon

REF: Project TDD: T10-9210-031

Analytical TDD: T10-9210-058

Project PAN: EOR-0201-SC

Analytical PAN: EOR-0202-AB

The data quality assurance review of 2 soil samples collected from the Northwest Pipe and Casing site in Clackamas, Oregon, has been completed. Analysis for Priority Pollutant Metals (EPA 6000 and 7000 series methods) was performed by Sound Analytical Services, Tacoma, Washington.

The 2 samples were numbered: T2100102 T2100103

Data Qualifications:

I Sample Holding Time: Acceptable.

The samples met QC holding time criteria. Sample T2100102 was collected 11-08-92. Sample T2100103 was collected 11-13-92. All analyses were performed on or before 12-01-92, therefore meeting QC criteria of less than 28 days between sampling and mercury analysis and less than 6 months between sampling and analysis for all other metals.

II Calibration

A. Initial Calibration and Calibration Verification: Acceptable.

All mercury results were within the control limits of 80 to 120 percent of the true values. All ICP results were within the 90 to 110 percent control limits.

B. Continuing Calibration: Acceptable.

All mercury results were within the control limits of 80 to 120 percent of the true values. All ICP results were within the control limits of 90 to 110 percent of the true values.

III Blanks: Satisfactory.

The following blanks contained elemental contamination above the Instrument Detection Limit (IDL):

<u>Blank</u>	<u>Element</u>	<u>Concentration</u>	<u>IDL</u>
ICB	Manganese	17.9 ug/L	15 ug/L
CCB6	Barium	5.3 ug/L	5 ug/L

ICB = Initial Calibration Blank
CCB = Continuing Calibration Blank

Manganese and barium results were flagged as not detected (U) in all samples if the amount detected in the samples was less than five times the amount detected in the blanks.

IV Interference Check Sample Analysis: Satisfactory.

All parameters for the Interference Check Sample (ICS) were within the control limit of 80 to 120 percent of the true values. Aluminum, calcium, cobalt, iron, and magnesium results were not provided for the ICSABF analysis. No action was taken based on ICS results as samples results for the interferents (aluminum, calcium, iron, and magnesium) were not provided for comparison with the ICS results.

V Laboratory Control Sample Analysis: Acceptable.

All Laboratory Control Sample results were within QC limits of 80 - 120 percent.

VI Specific Sample Results

A. Duplicate Sample Analysis: Acceptable.

For all sample values less than five times the CRDL, the duplicate sample values were within 2 times the CRDL. The Relative Percent Difference (RPD) values for the duplicate sample analysis were within QC criteria of less than 20 percent for sample values greater than five times the CRDL.

B. Spike Sample Analysis: Satisfactory.

All Matrix Spike recoveries for the elements analyzed were within QC limits, except:

<u>Sample</u>	<u>Element</u>	<u>Recovery</u>	<u>QC Limits</u>
T2100103S	Arsenic	71.3 %	75% - 125%
T2100103S	Lead	71.3 %	75% - 125%
T2100103S	Selenium	71.3 %	75% - 125%
T2100103S	Thallium	72.9 %	75% - 125%

Positive results and sample quantitation limits for arsenic, lead, selenium, and thallium were flagged as estimated quantities (J) in all samples.

C. Serial Dilution Analysis: Satisfactory.

All Serial Dilution results for the elements analyzed were within QC limits, except:

<u>Sample</u>	<u>Element</u>	<u>Difference</u>	<u>QC Limits</u>
T2100103L	Barium	11.0 %	< 10 %
T2100103L	Chromium	13.5 %	< 10 %
T2100103L	Zinc	12.1 %	< 10 %

Positive barium, chromium, and zinc results were flagged as estimated quantities (J) in all samples.

VII Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses".

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.

U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100102

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28462_ SDG No.: E&E_____

Matrix (soil/water): SOIL_ Lab Sample ID: 28462-1_____

Level (low/med): LOW_ Date Received: 12/03/92 *af*
11/13/92

% Solids: _69.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	1.5	U		P
7440-38-2	Arsenic	4.5	Q		P
7440-39-3	Barium	82.5	J		P
7440-41-7	Beryllium	0.33			P
7440-43-9	Cadmium	1.8			P
7440-70-2	Calcium				NR
7440-47-3	Chromium	18.1	J		P
7440-48-4	Cobalt				NR
7440-50-8	Copper	41.9			P
7439-89-6	Iron				NR
7439-92-1	Lead	2.5	J		P
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury				NR
7440-02-0	Nickel	18.1			P
7440-09-7	Potassium				NR
7782-49-2	Selenium	2.6	U	J	P
7440-22-4	Silver	0.26	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium	3.8	U	J	P
7440-62-2	Vanadium				NR
7440-66-6	Zinc	40.1	J		P
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100103

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28462_ SDG No.: E&E_

Matrix (soil/water): SOIL_ Lab Sample ID: 28462-2_

Level (low/med): LOW_ Date Received: 12/03/92 *11/13/92*

% Solids: _67.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony	1.6	U		P
7440-38-2	Arsenic	4.7	J		P
7440-39-3	Barium	77.4	J		P
7440-41-7	Beryllium	0.28			P
7440-43-9	Cadmium	1.1			P
7440-70-2	Calcium				NR
7440-47-3	Chromium	17.0	J		P
7440-48-4	Cobalt				NR
7440-50-8	Copper	34.6			P
7439-89-6	Iron				NR
7439-92-1	Lead	2.9	J		P
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury				NR
7440-02-0	Nickel	24.9			P
7440-09-7	Potassium				NR
7782-49-2	Selenium	2.7	U	J	P
7440-22-4	Silver	0.27	U		P
7440-23-5	Sodium				NR
7440-28-0	Thallium	4.0	U	J	P
7440-62-2	Vanadium				NR
7440-66-6	Zinc	60.8	J		P
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100102

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28462_ SDG No.: E&E_

Matrix (soil/water): SOIL_ Lab Sample ID: 28462-1_

Level (low/med): LOW_ Date Received: 12/03/92

% Solids: _69.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum		-		NR
7440-36-0	Antimony		-		NR
7440-38-2	Arsenic		-		NR
7440-39-3	Barium		-		NR
7440-41-7	Beryllium		-		NR
7440-43-9	Cadmium		-		NR
7440-70-2	Calcium		-		NR
7440-47-3	Chromium		-		NR
7440-48-4	Cobalt		-		NR
7440-50-8	Copper		-		NR
7439-89-6	Iron		-		NR
7439-92-1	Lead		-		NR
7439-95-4	Magnesium		-		NR
7439-96-5	Manganese		-		NR
7439-97-6	Mercury	0.11	U		AV
7440-02-0	Nickel		-		NR
7440-09-7	Potassium		-		NR
7782-49-2	Selenium		-		NR
7440-22-4	Silver		-		NR
7440-23-5	Sodium		-		NR
7440-28-0	Thallium		-		NR
7440-62-2	Vanadium		-		NR
7440-66-6	Zinc		-		NR
5955-70-0	Cyanide		-		NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

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1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

100103

Lab Name: SOUND_ANALYTICAL_SERVICES Contract: T109210031

Lab Code: _____ Case No.: _____ SAS No.: 28462_ SDG No.: E&E_

Matrix (soil/water): SOIL_ Lab Sample ID: 28462-2_

Level (low/med): LOW_ Date Received: 12/03/92

% Solids: _67.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				NR
7440-36-0	Antimony				NR
7440-38-2	Arsenic				NR
7440-39-3	Barium				NR
7440-41-7	Beryllium				NR
7440-43-9	Cadmium				NR
7440-70-2	Calcium				NR
7440-47-3	Chromium				NR
7440-48-4	Cobalt				NR
7440-50-8	Copper				NR
7439-89-6	Iron				NR
7439-92-1	Lead				NR
7439-95-4	Magnesium				NR
7439-96-5	Manganese				NR
7439-97-6	Mercury	0.11	U		AV
7440-02-0	Nickel				NR
7440-09-7	Potassium				NR
7782-49-2	Selenium				NR
7440-22-4	Silver				NR
7440-23-5	Sodium				NR
7440-28-0	Thallium				NR
7440-62-2	Vanadium				NR
7440-66-6	Zinc				NR
5955-70-0	Cyanide				NR

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:



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MEMORANDUM

DATE: January 19, 1993

TO: Dawn Hartley, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, TAT-Chemist, E & E, Seattle, WA *MW*

THRU: David Byers, TAT-Chemist, E & E, Seattle, WA *DRB*

SUBJ: Organic Data Quality Assurance Review, Northwest Pipe and Casing, Clackamas, Oregon

REF: Project TDD: T10-9210-031 Analytical TDD: T10-9210-058
Project PAN: EOR-0201-SC Analytical PAN: EOR-0202-AB

The data quality assurance review of 2 soil samples collected from the Northwest Pipe and Casing site in Clackamas, Oregon, has been completed. Analysis for Semivolatile Organic Compounds (EPA method 8270) was performed by Sound Analytical Services, Tacoma, Washington.

The 2 samples were numbered: T2100102 T2100103

Data Qualifications:

I Holding Time: Acceptable.

Sample T2100102 was collected 11-08-92 and sample T2100103 was collected on 11-13-92. Both samples were extracted on 11-18-92, and analyzed on 12-01-92. Both samples met QC criteria of 14 days from collection to extraction and 40 days from extraction to analysis.

II GC/MS Tuning: Acceptable.

All tuning check compound mass abundances and ratios were within contract-required limits for semivolatile analysis.

III Calibration

A. Initial Calibration: Satisfactory.

All System Performance Check Compounds (SPCCs) were within contract-required limits for the initial calibration with average Relative Response Factors (RRFs) above 0.05 for semivolatiles. All Calibration Check Compounds (CCCs) and non-CCCs were within contract-required limits for the initial calibration with % Relative Standard Deviations (RSDs) below 30 percent, except:

Date	Compound	%RSDs	Associated Samples
11-18-92	Benzoic Acid	36.9	All
	2,4-Dinitrophenol	37.2	All

No action was taken by the data reviewer as benzoic acid and 2,4-dinitrophenol were not detected in any sample.

B. Continuing Calibration: Satisfactory.

All CCCs were at or below the contract-required Relative Percent Difference (RPD) limits of 25 for the semivolatile continuing calibration. All compounds were at or above the contract-required Relative Response Factor (RRF(50)) QC criteria. All non-CCCs had percent difference (%D) values for the continuing calibration of less than or equal to 25 percent, except:

Date	Time	Compound	%D	QC Limits	Assoc. Samples
12-01-92	1921	1,4-Dichlorobenzene	67.5	< 25	All
	1921	Nitrobenzene	36.6	< 25	
	1921	bis(2-chloroethoxy)methane	62.7	< 25	

Sample quantitation limits for the continuing calibration QC outliers were flagged as estimated quantities (J) in the associated samples.

IV Method Blank: Satisfactory.

The following compound was detected in a method blank:

Blank	Compound	Concentration ug/Kg	Associated Samples
M. Blank	Di-n-butylphthalate	810	All

Results for the compound detected in the blanks were flagged as not detected (U) in the associated samples if the amount detected in the samples was less than 5 times the amount detected in the blank (10 times for common contaminants).

V Surrogate Recovery: Acceptable.

All surrogate results met QC criteria.

VI Matrix Spike/Matrix Spike Duplicates: Acceptable.

All matrix spike/matrix spike duplicate results were within QC limits.

VII Internal Standards: Acceptable.

All internal standard results were within QC limits.

VIII Field Duplicates: Not Applicable.

IX Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Directive "National Functional Guideline for Organic Data Review" (June 1991).

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.

U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

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Client ID: T2100102

Semivolatile Organics Per EPA SW-846 Method 8270

Date Extracted: 11-18-92

Date Analyzed: 12-1-92

Compound	Concentration ug/kg		
Phenol		460 U	
bis(2-Chloroethyl) ether		460	
2-Chlorophenol		460	
1,3-Dichlorobenzene		460	
1,4-Dichlorobenzene		460	J
Benzyl Alcohol		930	
1,2-Dichlorobenzene		460	
2-Methylphenol		460	
bis(2-Chloroisopropyl) ether		460	
4-Methylphenol		460	
N-Nitroso-Di-N-propylamine		460	
Hexachloroethane		460	
Nitrobenzene		460	J
Isophorone		460	
2-Nitrophenol		460	
2,4-Dimethylphenol		460	
Benzoic Acid		2,300	
bis(2-Chloroethoxy)methane		460	J
2,4-Dichlorophenol		460	
1,2,4-Trichlorobenzene		460	
Naphthalene		460	
4-Chloroaniline		930	
Hexachlorobutadiene		460	
4-Chloro-3-methylphenol		930	✓

MM 1-19-93

Continued

SOUND ANALYTICAL SERVICES, INC.

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Client ID: T2100102

EPA Method 8270 Continued

Compound	Concentration ug/kg		
2-Methylnaphthalene		460 U	
Hexachlorocyclopentadiene		460	
2,4,6-Trichlorophenol		460	
2,4,5-Trichlorophenol		460	
2-Chloronaphthalene		460	
2-Nitroaniline		2,300	
Dimethyl phthalate		460	
Acenaphthylene		460	
2,6-Dinitrotoluene		460	
3-Nitroaniline		2,300	
Acenaphthene		460	
2,4-Dinitrophenol		2,300	
4-Nitrophenol		2,300	
Dibenzofuran		460	
2,4-Dinitrotoluene		460	
Diethylphthalate		460	
4-Chlorophenyl phenyl ether		460	
Fluorene		460	
4-Nitroaniline		2,300	
4,6-Dinitro-2-methylphenol		2,300	
N-Nitrosodiphenylamine		460	
4-Bromophenyl phenyl ether		460	
Hexachlorobenzene		460	
Pentachlorophenol		2,300	
Phenanthrene		460	
Anthracene		460 V	
Di-n-butylphthalate	1,400 U		

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Continued

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Lab No. 28462-1

Client ID: T2100102

EPA Method 8270 Continued

Compound	Concentration ug/kg		
Fluoranthene	600	460 U	<i>MW</i> 1-19-93
Pyrene		460	
Butyl benzyl phthalate		460	
3,3'-Dichlorobenzidine		930	
Benzo(a)anthracene		460	
Chrysene		460 ↓	
bis(2-ethylhexyl)phthalate			
Di-n-octyl phthalate		460 U	
Benzo(b)fluoranthene		460	
Benzo(k)fluoranthene		460	
Benzo(a)pyrene		460	
Indeno(1,2,3-cd)pyrene		460	
Dibenz(a,h)anthracene		460	
Benzo(g,h,i)perylene		460 ↓	

SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28462-2

Client ID: T2100103

Semivolatile Organics Per EPA SW-846 Method 8270
 Date Extracted: 11-18-92
 Date Analyzed: 12-1-92

Compound	Concentration ug/kg		
Phenol		490 U	
bis(2-Chloroethyl) ether		490	
2-Chlorophenol		490	
1,3-Dichlorobenzene		490	
1,4-Dichlorobenzene		490	J
Benzyl Alcohol		980	
1,2-Dichlorobenzene		490	
2-Methylphenol		490	
bis(2-Chloroisopropyl)ether		490	
4-Methylphenol		490	
N-Nitroso-Di-N-propylamine		490	
Hexachloroethane		490	
Nitrobenzene		490	J
Isophorone		490	
2-Nitrophenol		490	
2,4-Dimethylphenol		490	
Benzoic Acid		2,500	
bis(2-Chloroethoxy)methane		490	J
2,4-Dichlorophenol		490	
1,2,4-Trichlorobenzene		490	
Naphthalene		490	
4-Chloroaniline		980	
Hexachlorobutadiene		490	
4-Chloro-3-methylphenol		980	✓

MM H9-93

Continued

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Lab No. 28462-2

Client ID: T2100103

EPA Method 8270 Continued

Compound	Concentration ug/kg		
2-Methylnaphthalene		490 U	
Hexachlorocyclopentadiene		490	
2,4,6-Trichlorophenol		490	
2,4,5-Trichlorophenol		490	
2-Chloronaphthalene		490	
2-Nitroaniline		2,500	
Dimethyl phthalate		490	
Acenaphthylene		490	
2,6-Dinitrotoluene		490	
3-Nitroaniline		2,500	
Acenaphthene		490	
2,4-Dinitrophenol		2,500	
4-Nitrophenol		2,500	
Dibenzofuran		490	
2,4-Dinitrotoluene		490	
Diethylphthalate		490	
4-Chlorophenyl phenyl ether		490	
Fluorene		490	
4-Nitroaniline		2,500	
4,6-Dinitro-2-methylphenol		2,500	
N-Nitrosodiphenylamine		490	
4-Bromophenyl phenyl ether		490	
Hexachlorobenzene		490	
Pentachlorophenol		2,500	
Phenanthrene		490	
Anthracene		490 V	
Di-n-butylphthalate	1,400 U		

MW 1-9-93

Continued

SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28462-2

Client ID: T2100103

EPA Method 8270 Continued

Compound	Concentration ug/kg		
Fluoranthene	540	490 U	
Pyrene		490	
Butyl benzyl phthalate		490	
3,3'-Dichlorobenzidine		980	
Benzo(a)anthracene		490	
Chrysene		490	
bis(2-ethylhexyl)phthalate			
Di-n-octyl phthalate		490 U	
Benzo(b)fluoranthene		490	
Benzo(k)fluoranthene		490	
Benzo(a)pyrene		490	
Indeno(1,2,3-cd)pyrene		490	
Dibenz(a,h)anthracene		490	
Benzo(g,h,i)perylene		490	

MM 1-9-93



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International Specialists in the Environment

MEMORANDUM

DATE: February 4, 1993

TO: Dawn Hartley, Project Manager, E & E, Seattle. WA

FROM: Mark Woodke, TAT-Chemist, E & E, Seattle. WA *MW*

THRU: David Byers, TAT-Chemist, E & E, Seattle. WA *DRB*

SUBJ: Organic Data Quality Assurance Review, Northwest Pipe and Casing, Clackamas, Oregon

REF: Project TDD: T10-9210-031 Analytical TDD: T10-9210-058
Project PAN: EOR-0201-SC Analytical PAN: EOR-0202-AB

The data quality assurance review of 1 water sample collected from the Northwest Pipe and Casing site in Clackamas, Oregon, has been completed. Analysis for Total Organic Carbon (EPA method 415.1) was performed by Sound Analytical Services, Tacoma, Washington.

The sample was numbered: T2100120

Data Qualifications:

I Holding Time: Acceptable.

Sample T2100120 was collected 11-20-92, and was extracted and analyzed on 12-02-92. The method states to analyze the sample as soon as possible after collection. No action was taken based on the 12 days between collection and analysis as the sample was preserved properly and was kept at 4 degrees celsius from collection until analysis.

II Calibration: Acceptable.

A two-point calibration was performed prior to sample analysis, with all results acceptable in the reviewers' professional judgment.

III Method Blank: Acceptable.

No organic carbon was detected in the method blank.

IV Matrix Spike/Matrix Spike Duplicates: Acceptable.

The matrix spike/matrix spike duplicate recoveries were both 90 %, which is acceptable in the reviewers' professional judgment.

V Duplicates: Acceptable.

The duplicate Relative Percent Difference was 11 %, which is acceptable in the reviewers' professional judgment.

VI Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Directive "National Functional Guidelines for Organic Data Review" (June 1991) and EPA Method 415.1.

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

- J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.
- U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

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Lab No. 28636-10

Client ID: T2100120 (water)

Total Organic Carbon Per EPA Method 415.1
Date Extracted: 12-2-92
Date Analyzed: 12-2-92

TOC

9 mg/L

MW
2-4-93

Continued



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MEMORANDUM

DATE: February 11, 1993

TO: Dawn Hartley, Project Manager, E & E, Seattle, WA

FROM: Mark Woodke, TAT-Chemist, E & E, Seattle, WA *MW*

THRU: David Byers, TAT-Chemist, E & E, Seattle, WA *DB*

SUBJ: Chlorinated Pesticide/PCB Data Quality Assurance Review,
Northwest Pipe and Casing, Clackamas, Oregon

REF: Project TDD: T10-9210-031 Analytical TDD: T10-9210-058
Project PAN: EOR-0201-SC Analytical PAN: EOR-0201-AB

The data quality assurance review of sixteen water and two soil samples collected from the Northwest Pipe and Casing site in Clackamas, Oregon, has been completed. Analysis for Chlorinated Pesticides/Polychlorinated Biphenyls (EPA method 8080) was performed by Sound Analytical Services, Tacoma, Washington.

The samples were numbered:

T2100104	T2100105	T2100106	T2100110
T2100111	T2100112	T2100113	T2100114
T2100115	T2100116	T2100117	T2100118(soil)
T2100119(soil)	T2100120	T2100121	T2100122
T2100123	T2100124		

Data Qualifications:

I Sample Holding Time: Acceptable.

Samples T2100104 through T2100106 were collected 11-18-92. Samples T2100110 through T2100117 were collected 11-19-92. Samples T2100118 through T2100120 and T2100124 were collected 11-20-92. Samples T2100121 through T2100123 were collected 11-14-92. All extractions were performed on or before 11-25-92. All analyses were performed on or before 12-02-92. The samples were within QC holding time criteria of 14 days between collection and extraction and 40 days between extraction and analysis.

II Instrument Performance: Acceptable.

Peak resolution for all compounds was acceptable. The surrogate retention time shift was within QC limits on at least one column for each sample.

III Calibration

A. Initial Calibration: Acceptable.

A three-point initial calibration was performed for each pesticide of interest, with all % Relative Standard Deviation (%RSDs) within QC limits of < 15 %. A one-point initial calibration was performed for each PCB of interest.

B. Continuing Calibration: Satisfactory.

All continuing calibration results were within QC limits, except:

<u>Compound</u>	<u>Column</u>	<u>% Difference</u>	<u>QC Limits</u>
Methoxychlor	DB-608	16 %	< 15 %

No action was taken by the data reviewer as the methoxychlor difference on the DB-5 column was within QC limits and methoxychlor was not detected in any of the samples.

IV Method Blank: Acceptable.

No contaminants were detected in any method blanks.

V Surrogate Recoveries: Satisfactory.

All recoveries for decachlorobiphenyl(DCB) and tetrachloro-meta-xylene(TCMX) were within QC criteria, except:

<u>Sample</u>	<u>Column</u>	<u>Surrogate</u>	<u>Recovery</u>	<u>QC Limits</u>
T2100104	DB-608	TCMX	44 %	60 % - 150 %
	DB-608	DCB	55 %	60 % - 150 %

No action was taken by the data reviewer as the surrogate results on the DB-5 column were within QC limits.

VI Matrix Spike/Matrix Spike Duplicate: Acceptable.

The matrix spike/matrix spike duplicate percent recoveries were within QC limits.

VII Field Duplicates: Not Applicable.

VIII Compound Identification: Acceptable.

Compound identification, including dual column confirmation, was acceptable.

IX Compound Quantitation and Reported Detection Limits: Acceptable.

Compound quantitation was acceptable.

X Overall Assessment of Data for Use

The overall usefulness of the data is based on the criteria outlined in the OSWER Directive "National Functional Guidelines For Organic Data Review" (June 1991).

Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

J - The associated numerical value is an estimated quantity because the reported concentrations were less than the contract required detection limits or quality control criteria were not met.

U - The material was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.

SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-1

Client ID: T2100114 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01 ✓
α-BHC	0.01
β-BHC	0.01
γ-BHC	0.01
γ-BHC (Lindane)	0.01
Chlordane (technical)	0.10
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.10
Aroclor 1016	0.10
Aroclor 1221	0.10
Aroclor 1232	0.10
Aroclor 1242	0.10
Aroclor 1248	0.10
Aroclor 1254	0.10
Aroclor 1260	0.10
Aroclor 1262	0.10
Aroclor 1268	0.10 ✓

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Continued . . .

SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-2

Client ID: T2100112 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>	<u>POL</u>
Aldrin		0.01 ✓
α-BHC		0.01
β-BHC		0.01
γ-BHC		0.01
γ-BHC (Lindane)		0.01
Chlordane (technical)		0.10
4,4'-DDD		0.01
4,4'-DDE		0.01
4,4'-DDT		0.01
Dieldrin		0.01
Endosulfan I		0.01
Endosulfan II		0.01
Endosulfan sulfate		0.01
Endrin		0.01
Endrin aldehyde		0.01
Heptachlor		0.01
Heptachlor epoxide		0.01
Endrin Ketone		0.01
Methoxychlor		0.02
Toxaphene		0.10
Aroclor 1016		0.10
Aroclor 1221		0.10
Aroclor 1232		0.10
Aroclor 1242		0.10
Aroclor 1248		0.10
Aroclor 1254		0.10
Aroclor 1260		0.10
Aroclor 1262		0.10
Aroclor 1268		0.10 ✓

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SOUND ANALYTICAL SERVICES, INC.

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Lab No. 28636-3

Client ID: T2100113 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01
a-BHC	0.01
b-BHC	0.01
g-BHC	0.01
γ-BHC (Lindane)	0.01
Chlordane (technical)	0.10
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.10
Aroclor 1016	0.10
Aroclor 1221	0.10
Aroclor 1232	0.10
Aroclor 1242	0.10
Aroclor 1248	0.10
Aroclor 1254	0.10
Aroclor 1260	0.10
Aroclor 1262	0.10
Aroclor 1268	0.10

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SOUND ANALYTICAL SERVICES. INC.

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Lab No. 28636-4

Client ID: T2100104 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01 U
a-BHC	0.01
b-BHC	0.01
g-BHC	0.01
y-BHC (Lindane)	0.01
Chlordane (technical)	0.10
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.10
Aroclor 1016	0.10
Aroclor 1221	0.10
Aroclor 1232	0.10
Aroclor 1242	0.10
Aroclor 1248	0.10
Aroclor 1254	0.10
Aroclor 1260	0.10
Aroclor 1262	0.10
Aroclor 1268	0.1 ✓

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Continued . . .

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Lab No. 28636-5

Client ID: T2100105 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>	<u>POL</u>
Aldrin		0.01
α-BHC		0.01
β-BHC		0.01
γ-BHC		0.01
γ-BHC (Lindane)		0.01
Chlordane (technical)		0.10
4,4'-DDD		0.01
4,4'-DDE		0.01
4,4'-DDT		0.01
Dieldrin		0.01
Endosulfan I		0.01
Endosulfan II		0.01
Endosulfan sulfate		0.01
Endrin		0.01
Endrin aldehyde		0.01
Heptachlor		0.01
Heptachlor epoxide		0.01
Endrin Ketone		0.01
Methoxychlor		0.02
Toxaphene		0.10
Aroclor 1016		0.10
Aroclor 1221		0.10
Aroclor 1232		0.10
Aroclor 1242		0.10
Aroclor 1248		0.10
Aroclor 1254		0.10
Aroclor 1260		0.10
Aroclor 1262		0.10
Aroclor 1268		0.10

MMR
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Continued . . .

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Lab No. 28636-6

Client ID: T2100106 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>	<u>POL</u>
Aldrin		0.01
a-BHC		0.01
b-BHC		0.01
g-BHC		0.01
γ-BHC (Lindane)		0.01
Chlordane (technical)		0.10
4,4'-DDD		0.01
4,4'-DDE		0.01
4,4'-DDT		0.01
Dieldrin		0.01
Endosulfan I		0.01
Endosulfan II		0.01
Endosulfan sulfate		0.01
Endrin		0.01
Endrin aldehyde		0.01
Heptachlor		0.01
Heptachlor epoxide		0.01
Endrin Ketone		0.01
Methoxychlor		0.02
Toxaphene		0.10
Aroclor 1016		0.10
Aroclor 1221		0.10
Aroclor 1232		0.10
Aroclor 1242		0.10
Aroclor 1248		0.10
Aroclor 1254		0.10
Aroclor 1260		0.10
Aroclor 1262		0.10
Aroclor 1268		0.10

Continued . . .

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Lab No. 28636-7

Client ID: T2100117 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080
Date Extracted: 11-25-92
Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01
a-BHC	0.01
b-BHC	0.01
g-BHC	0.01
γ-BHC (Lindane)	0.01
Chlordane (technical)	0.10
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.10
Aroclor 1016	0.10
Aroclor 1221	0.10
Aroclor 1232	0.10
Aroclor 1242	0.10
Aroclor 1248	0.10
Aroclor 1254	0.10
Aroclor 1260	0.10
Aroclor 1262	0.10
Aroclor 1268	0.10

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Lab No. 28636-8

Client ID: T2100118 (soil)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, mg/kg</u>
Aldrin	0.001
a-BHC	0.001
b-BHC	0.001
g-BHC	0.001
γ-BHC (Lindane)	0.001
Chlordane (technical)	0.010
4,4'-DDD	0.001
4,4'-DDE	0.001
4,4'-DDT	0.001
Dieldrin	0.001
Endosulfan I	0.001
Endosulfan II	0.001
Endosulfan sulfate	0.001
Endrin	0.001
Endrin aldehyde	0.001
Heptachlor	0.001
Heptachlor epoxide	0.001
Endrin Ketone	0.001
Methoxychlor	0.002
Toxaphene	0.010
Aroclor 1016	0.010
Aroclor 1221	0.010
Aroclor 1232	0.010
Aroclor 1242	0.010
Aroclor 1248	0.010
Aroclor 1254	0.010
Aroclor 1260	0.010
Aroclor 1262	0.010
Aroclor 1268	0.010

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Lab No. 28636-9

Client ID: T2100119 (soil)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, mg/kg</u>
Aldrin	0.001
a-BHC	0.001
b-BHC	0.001
g-BHC	0.001
y-BHC (Lindane)	0.001
Chlordane (technical)	0.010
4,4'-DDD	0.001
4,4'-DDE	0.001
4,4'-DDT	0.001
Dieldrin	0.001
Endosulfan I	0.001
Endosulfan II	0.001
Endosulfan sulfate	0.001
Endrin	0.001
Endrin aldehyde	0.001
Heptachlor	0.001
Heptachlor epoxide	0.001
Endrin Ketone	0.001
Methoxychlor	0.002
Toxaphene	0.010
Aroclor 1016	0.010
Aroclor 1221	0.010
Aroclor 1232	0.010
Aroclor 1242	0.010
Aroclor 1248	0.010
Aroclor 1254	0.010
Aroclor 1260	0.010
Aroclor 1262	0.010
Aroclor 1268	0.010

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Lab No. 28636-10

Client ID: T2100120 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01
a-BHC	0.01
b-BHC	0.01
g-BHC	0.01
γ-BHC (Lindane)	0.01
Chlordane (technical)	0.10
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.10
Aroclor 1016	0.10
Aroclor 1221	0.10
Aroclor 1232	0.10
Aroclor 1242	0.10
Aroclor 1248	0.10
Aroclor 1254	0.10
Aroclor 1260	0.10
Aroclor 1262	0.10
Aroclor 1268	0.10

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Lab No. 28636-15

Client ID: T2100115 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01
α-BHC	0.01
β-BHC	0.01
γ-BHC	0.01
γ-BHC (Lindane)	0.01
Chlordane (technical)	0.010
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.1
Aroclor 1016	0.1
Aroclor 1221	0.1
Aroclor 1232	0.1
Aroclor 1242	0.1
Aroclor 1248	0.1
Aroclor 1254	0.1
Aroclor 1260	0.1
Aroclor 1262	0.1
Aroclor 1268	0.1

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Lab No. 28636-16

Client ID: T2100116 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01
α-BHC	0.01
β-BHC	0.01
γ-BHC	0.01
γ-BHC (Lindane)	0.01
Chlordane (technical)	0.10
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.10
Aroclor 1016	0.10
Aroclor 1221	0.10
Aroclor 1232	0.10
Aroclor 1242	0.10
Aroclor 1248	0.10
Aroclor 1254	0.10
Aroclor 1260	0.10
Aroclor 1262	0.10
Aroclor 1268	0.10

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Lab No. 28636-17

Client ID: T2100110 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01
α-BHC	0.01
β-BHC	0.01
γ-BHC	0.01
γ-BHC (Lindane)	0.01
Chlordane (technical)	0.10
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.10
Aroclor 1016	0.10
Aroclor 1221	0.10
Aroclor 1232	0.10
Aroclor 1242	0.10
Aroclor 1248	0.10
Aroclor 1254	0.10
Aroclor 1260	0.10
Aroclor 1262	0.10
Aroclor 1268	0.10

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Lab No. 28636-19

Client ID: T2100111 (water)

Organochlorine Pesticides and PCB's Per EPA Method 8080

Date Extracted: 11-25-92

Date Analyzed: 12-2-92

<u>Compound</u>	<u>Concentration, ug/l</u>
Aldrin	0.01
a-BHC	0.01
b-BHC	0.01
g-BHC	0.01
y-BHC (Lindane)	0.01
Chlordane (technical)	0.10
4,4'-DDD	0.01
4,4'-DDE	0.01
4,4'-DDT	0.01
Dieldrin	0.01
Endosulfan I	0.01
Endosulfan II	0.01
Endosulfan sulfate	0.01
Endrin	0.01
Endrin aldehyde	0.01
Heptachlor	0.01
Heptachlor epoxide	0.01
Endrin Ketone	0.01
Methoxychlor	0.02
Toxaphene	0.10
Aroclor 1016	0.10
Aroclor 1221	0.10
Aroclor 1232	0.10
Aroclor 1242	0.10
Aroclor 1248	0.10
Aroclor 1254	0.10
Aroclor 1260	0.10
Aroclor 1262	0.10
Aroclor 1268	0.10

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